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USSR: Computers

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SCIENCE & TECHNOLOGY

USSR: COMPUTERS

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HARDWARE

UDC 681.3

CREATION OF EXTERNAL MEMORY FIELDS FOR YeS COMPUTER SYSTEMS

Moscow OTECHESTVENNYY OPYT V OTRASLI 'SVYAZ.' SERIYA: EKONOMIKA, PLANIROVANIYA UPRAVLENIYA. EKSPRESS-INFORMATSIYA in Russian No 3-4, 1987 (signed to press 7 Jan 86) pp 7-10

[Article by D.I. Aleshin and T.V. Kuznetsova]

[Text] The creation of common external memory fields using the YeS-1033 computer is the result of cooperation between two creative teams: electronic engineers and programmers. Bringing these systems on line has had a significant economic impact on the MTTsUMS [Moscow Technical Center for Communications Trunk Management] with small (one-time) additional expenditures. The development makes it possible to incorporate the YeS-1033 computers in a comprehensive system while preserving their overall performance, the capability of on-line redistribution of machine resources as well as the extensive application of multiprogram and batch processing modes, which enhances the computer utilization efficiency. The control of the common memory field is simple and accessible to the computer operators, even with the high level of technical complexity of the hardware and software system complex.

The following hardware is needed to set up a computer system based on the YeS-1033 computer using a common external memory field based on changeable magnetic disks and magnetic tapes:

--YeS-1033 computers: 2;

--YeS-5568 disk controllers in a complete system with the YeS-5061 stores: 2-4;

--YeS-5517 magnetic tape storage controllers in complete sets with the YeS-5017.02 stores: 2;

--A supplemental complete set of standard interface cables 10 to 15 m long: 1.

The goal of this developmental effort is:

--Improve the reliability of the hardware system by means of incorporating the YeS-1033 computers in a complete two-machine computer system;

--Provide for real-time redistribution of external computer memory resources;

--Enhance the machine time utilization efficiency by improving the size of the external memory accessible to each computer;

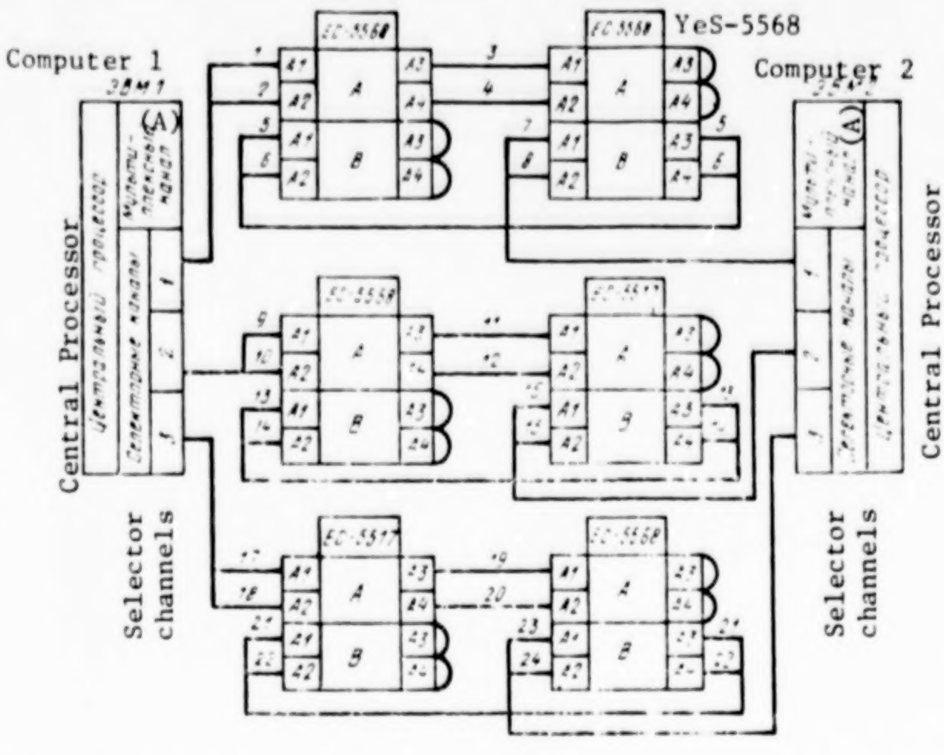
--Extensive implementation of multiprogram operating modes and automated program debugging by a large number of users simultaneously;

--Curtailing the labor expenditures for handling system operations;

--Assuring the capability of "block" back-up redundancy for the equipment by the mutual interchange of the most frequently used peripherals: the magnetic tape and magnetic disk stores.

Description of the Interconnection Circuitry

Two subchannels, A and B, are provided for the controllers (the disk and tape storage controllers), which make it possible to independently access the stores from the two computers, and are equivalent; each of the subchannels has input (A1 and A2) and output (A3 and A4) connectors for the connection of the interface cables (see the diagram).



Key: A. Multiplex channel.

The input of subchannel A of the YeS-5568 disk controller is connected to the first selector channel of computer 1 by means of cables 1 and 2, while the controller output is connected to subchannel A of the second YeS-5568 disk controller (cables 3 and 4), the output connectors of which have dummy terminations. This circuit makes it possible for computer 1 to access any disk controller via the A subchannels.

The first selector channel of computer 2 is connected to the input of subchannel B of the disk controller (cables 7 and 8). The output of this disk controller is connected to the input of the second disk controller (cables

5 and 6), while the output of the latter has a dummy termination. This circuit makes it possible to access any disk controller from the first channel of computer 2 via the B subchannels. Thus, each of the two computers has access to any magnetic disk store.

The connection configuration for the second selector channel is similar to the first channel connection circuitry, with the only difference that instead of one of the disk controller racks, a YeS-5517 magnetic tape storage controller rack is used, the procedure for the connection of which to the YeS-1033 computer is similar.

The connection circuitry for the third selector channel completely matches the connection configuration for the second channel.

It must be noted that because of the high speed of the YeS-5061 disk stores, their control racks are connected to the second and third selector channels of computer 1 and computer 2 in such a way that each of the computers has direct access to one of these peripherals. Problems of priority do not exist for the first selector channel where identical peripherals are connected.

Description of System Operations

In order to support the functioning of two-machine computer systems having a common external memory field, it is necessary to do additional system work: the generation of the resident disk, that enables operation only with the numbers of the disk keys 0, 1, 2, 6 and 7. In this case, the hardware for direct access with keys 6 and 7 must be used by two processors. This capability is realized with the specification of the appropriate parameter in the IOCONTRL macroinstruction in the first generation stage. The first stage includes the process of assembling the generation macroinstructions that describe the new operating system, and then the creation of the job flow for generation. During the second stage, the generation job flow is processed by the Assembler, the linkage editor and the service programs. The result of the second stage is a new operating system; it is necessary to accomplish the input-output generation on the basis of the generated operating system. The resident disk produced following this generation must support the operation of the disks having keys 3, 4, 5, 6 and 7. Disks with keys 6 and 7 will also be used by two processors.

It is expedient when organizing operations for two-machine computer systems using a common external memory field to employ disks that contain the normative reference information, user libraries and certain system libraries. This makes it possible to implement multiprogram operating modes and automated program debugging simultaneously by a large number of users. In this case, the machine time utilization efficiency is improved, since the size of the external memory accessible to each computer is increased significantly. In case one of the machines is out of service, the tasks being executed in it can be partially transferred to another computer by virtue of the supplemental external memory resources.

The use of a common external memory field significantly curtails the labor expenditures for system work and enables the timely insertion of changes in the library of procedures, the library of load modules and the computer card files, avoiding the intermediate storage medium (tape). The quality and reliability of the data are improved in this case.

The work of putting the system together was accomplished using the YeS-1033 computers, but there are no fundamental obstacles to the design of similar common external memory fields using other types of computers having a generally accepted configuration and containing standard interface and control hardware.

8225
CSO: 1863/246

ASSEMBLY-LINE PRODUCTION OF YeS-1840

Minsk SOVETSKAYA BELORUSSIYA in Russian 2 Apr 87 p 2

[Article, unsigned, "The Computer on the Conveyor Belt"]

[Text] Small in size, but having many of the capabilities of a large computer is the country's first single-user personal professional computer, whose serial production is under way in the Minsk computer hardware production plant. At the plant a 100% presentation of this production for government acceptance has begun.

The basic significance of the "YeS-1840" is in freeing specialists from unproductive, routine work. It can solve scientific-technical, economic, and administrative problems, and it improves the productivity and effectiveness of management, calculations, various aspects of editing, and clerical work. The computer is suitable for doctors and engineers, commercial workers, and designers.

Connecting the personal computer to a YeS-type mainframe, one can use its data base, executing the most complex operations. The work of those who used the first samples showed that the "YeS-1840" is economical and reliable in operation.

Before the end of the year, the Minsk computer hardware production plant will produce several thousand single-user personal computers, and next year, three times as many.

13264/5915
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ELBRUS, OTHER COMPUTER PROJECTS OUTLINED

Moscow IZVESTIYA in Russian 3 May 87 p 2

[Article by A. P. Yershov, academician, entitled "The History of the Creation of New Powerful Computers Shows how Success Comes"]

[Text] All of us joyfully experienced the good words spoken by Mikhail Sergeyevich Gorbachev at the 20th Congress of the VLKSM, in his address to the youth collectives of Moscow and Novosibirsk, who had made mock-ups of contemporary computer hardware. I happened to be a close witness of the development of the projects, and this gives me the basis to speak confidently of the conformance to principle of the arduous success of each of them.

First of all, about the "Elbrus"--this powerful universal computer of general significance. It capped a series of systems created at the Institute of Precision Mechanics and Computer Hardware, which bears the name of the outstanding scientist, academician S. A. Lebedev.

The "Elbrus" is the last machine whose main principle was developed by S. A. Lebedev. By this one can more easily see that all of the most interesting scientific ideas were taken up and worthily developed in the works of the young collective which came to replace the scientists who had created our first Soviet million-instructions-per-second computer--the BESM-6.

The project did not receive the name of a mountain peak by chance. This was not only a tribute to the influence of the many developers who spent their off days on the slopes of the Caucasian mountain ridge. The creation of the "Elbrus-2" was a most difficult ascent to a system which exceeds by two orders of magnitude the previous model in productivity.

The increase by one order of magnitude in this breakthrough came by switching to a new component base--to high-speed electronic integrated circuits, operating in billionths of a second.

For the increase to the second order of magnitude, it was necessary to work out a principally new organization of the whole computer system, or, properly speaking, the computer architecture. This permits joining up to ten powerful processors for solving one task. Their great speed is reinforced by the special organization of computer memory, which allows information to be passed to all the processors at their processing rate.

I happened to take part in the development of the conceptual design of the "Elbrus." Then I already had received a deep impression of the scientific depth of the design, and the assiduous analysis of all accessible technical decisions brought forth by the machine's main architect, then a young and still little-known scientist, now a corresponding member of the Academy of Sciences of the USSR, Boris Artashesovich Babayan. The design had to satisfy hundreds of partially contradictory requirements. But Babayan fully possessed the remarkable quality of absolute independence of thought, combined with a most attentive and masterful estimation of any technical decisions which characterize the "universal level" of the computer hardware.

As far as I know, the "Elbrus" was the first supercomputer in the world in which all system software is developed in a high-level language. This was called the El-76 by the authors. This is a native programming language with a Russian lexicon, which young people who already know an algorithmic language from a school course in information science can easily adopt.

A great contribution to developing software for the "Elbrus" was provided by the young scientists of Novosibirsk. With the decisive support of academicians M. A. Lavrentyev and G. I. Marchuk, the Novosibirsk affiliate ITM was developed in Akademgorodok. For a long time until the conclusion of the machine design, its simulators and program models were done in the affiliate. Using these tools, the system and applications programs for the "Elbrus" were developed in good time. They immediately went to work mastering the first industrial models of the machine.

The principle of the priority of programming methods before the purely design problems of constructing the machine went into practice precisely with the appearance of the "Elbrus".

The "Elbrus" project is provided with weighty government support. However, it is naive to suppose in the slightest that the project was fated for success earlier.

In the very beginning of the work, the Institute was orphaned when Sergey Alekseyevich Lebedev passed on to his final journey, leaving the advance project of the machine as his scientific testament. The Institute's collective had to undergo a period of instability with the loss of a series of leading co-workers. Here the leadership changed. As a result, the Institute could not fill the almost twenty-year gap caused by the lack of a computer which could have occupied the position between the BESM-6 and the "Elbrus."

The entire course of the project in its entirety itself experienced the operation of the braking mechanism which gathered strength in the 1970's.

And nevertheless, the collective not only brought work to the foreseen conclusion, but also gathered strength and acceleration for a continuation of the work, and the mastery of "Elbruses" of new orders of speed and power.

An important contribution of the "Elbrus" project (besides the construction of the machine and its software) was the organization of a remarkable collective of engineers, mathematicians, and programmers, which corresponding member of

the AN SSSR G. G. Ryabov now heads. Here are joined the experience of the first students of academician S. A. Lebedev with the energy and erudition of the graduates of the Moscow Physical Technical Institute and the Novosibirsk University. For the young ones, the "Elbrus" was their first serious work and showed the possibility of a breakthrough in science, when the leaders are not afraid to entrust a great task to those who are young enough to be their sons.

The center of attraction and scientific leader of the "Start" collective was Vadim Yevgenyevich Kotov. His biography is a series of entirely decisive actions.

After finishing Moscow Engineering and Physics Institute and receiving an appointment to the capital's solid-state plant, he was transferred in 1961, together with a group of his adherents, to the Computer Center of the Siberian Division of the AN SSSR, just then being organized, where he works to this very day. This was an action which defined the further path of this scientist. Kotov's main scientific interest was the development of parallel-architecture computer systems. For many years he was immersed in the mathematics and theory of programming. With time, his work on so-called parallelization of algorithms, control models in parallel computations, received All-Union and international renown.

And then he was sharply switched from the ordained path of a theoretical and academic career, to the rocky road of project leadership. Fifteen years of working in mathematics did not go for naught, and he worked out the possibility of creating theoretically motivated projects. Such a possibility is especially important in creating parallel-operation systems, where the intuition of human thought and sequential logical reasoning simply does not apply.

V. E. Kotov's first project, the so-called "Mars-0", was experimental in all respects. Likewise in the organizational aspect. He attempted to join the academic character of his project with the particularities of plant production. Even now, he is never limited by the need to seek and find concrete results from his thesis, but feels obligated to strive to work out the principles of operation. Indeed, this is how a man finds wisdom.

In one item Vadim Yevgenyevich was clearly lucky. By chance he came across a group of talented physics graduates of Novosibirsk University. In their course work they pushed away from the experimental work of the Swiss professor Nikolaus Wirth, which had been accepted at that time, and planned a micro-computer possessing a series of interesting properties. In particular, just as in the "Elbrus", their brainchild was to be oriented to higher-level programming languages.

But not by accident was the succeeding alliance of the developers of the "Kronos"--as the students named their project--and V. E. Kotov's collective. This alliance coincided with the beginning of the reorganization in the country.

Here we must speak of the following decisive step by Kotov. The idea of temporary scientific-technical collectives was still only ripening in the bosom of the GNKT, but Kotov already was proposing to create one for rapid progress

in the area of a new generation of microcomputers. The GKNT actively supported him. However, all work in forming the temporary collective and its "building" in our weakly prepared economic mechanism again fell on the shoulders of the initiators. And now the "Kronos" student project, begun several years ago, must be one of the first, if not the first, development of the new generation of Soviet personal computers. This means that already in the current five-year plan machines are acquiring the million instructions/sec power for the divisional work places of scientific workers, designers, and inventors.

What will the two new computer projects bring about?

First of all: the predictability and earned nature of success. Continuing the Alpine metaphor, one can make the observation, almost banal but unavoidable: it is not possible to approach worthily the peak without going the whole distance on one's own feet. There are no exceptions to this rule. Any achievement which pushes forward the measure of our understanding or knowledge, has an extended scientific and technical pre-history, which one can not borrow, but only live through. This is the second, very important, conclusion.

The third is that originality of thought is inseparable from the possession of a level of peace, and technical decisions receive motivating force only in the presence of fundamental knowledge.

And the fourth, and main, conclusion is that the fulfillment of socially defined work of difficulty requires an inexhaustible supply of high morality, which often serves as the only source of energy for people, and the force which joins them into a collective.

All this sounds somewhat general, but believe me, the many years of history of the "Elbrus" and the "Mars-Kronos-Start" projects, remembered at the 20th Congress of the VLKSM, provides confirmation for these simple truths.

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SOVIET PC STRATEGY OUTLINED

Moscow RABOCHAYA GAZETA in Russian 12 Sep 86 p 2

[Interview conducted by A. Tertychnyy, "A Formula for Overtaking" under the rubric "The Labor Force of Science"]

[Text] How can you get out ahead without catching up?

At first sight this task would seem to be a paradox, a clever play on words. But if you think about it, it is not hard to understand such a "formula for going around" has become the only possible one for overcoming the fatal philosophy of imitation and mediocrity, which received a decisive condemnation at the June (1986) Plenum of the Central Committee of the Communist Party of the Soviet Union.

Just such a path has been taken by some famous academic institutions: the Institute of Electric Welding imeni Ye. O. Paton, the Institute of Problems of Materials Science, the Experimentation and Design Bureau imeni O. K. Antonov, and other standard-bearers of scientific and technical progress in our Republic. Such a task is also being solved by the creators of personal computers (PC's).

Soviet scientists and designers have created a series of personal computers which, by a number of characteristics, leave nothing to be desired in comparison with the world's best models. In an interview with our RABOCHAYA GAZETA correspondent, Deputy Director of the Institute of Cybernetics imeni V. M. Glushkov of the Ukrainian SSR Academy of Sciences, Doctor of Technical Sciences, Professor A. V. Palagin tells us how such a result was attained in such a key area of scientific and technical progress.

[Q]--Aleksandr Vasil'yevich, we have all heard of personal computers for several years now. But even today the mention of this novelty among some people inspires various, at times fantastic notions.

[A]--Yes, our Institute is working intensively to create computer devices of a new class--personal computers. They are such a powerful instrument for amplifying intellectual activity, that in the force of their impact on civilization they are being compared with the coming of printed books.

Indeed, this example is an awkward one, like any concrete comparison: the book, you see, always was and still remains a passive medium for storing knowledge. But the PC is the first instrument in human history which is able to directly transform the knowledge of an individual into an active force.

The computer takes on itself the most labor-intensive, routine part of the work, which even for people of the so-called creative professions takes up on average three-quarters of their time. Of course, a computer cannot design a machine for a designer, make a correct decision for a factory director or a shop foreman, make a discovery for a scientist, or cure a patient for a doctor. But the machine is capable of taking on itself a large part of the preparatory work--the collection, storage and preliminary analysis of information.

Such intellectual reserve capacity has arrived at a very opportune time to satisfy society's acute demands for automation of nonproductive operations. Judge for yourself: although the productivity of labor in industry in the last decades has grown on average by a factor of fifteen, in the sphere of management it has grown ten times more slowly.

As a result, the clerical field (to which belong practically all white-collar workers) in the industrially developed countries has been growing relentlessly and today has swallowed up almost fifty percent of all working people. PC's are the only thing that can increase the productivity of their work.

[Q]--But many people, though, even with a technical education, consider a PC as something like an expensive electronic toy.

[A]--This misconception has taken on quite a life of its own, just because there is a portion of truth in it. You see, the first models of personal computers actually were created in the sphere of the toy industry. And only afterwards did it become clear that the toys' "talent" for business made them in principle able to compete with desktop computers.

But the designers of these desktop computers underestimated the difficulty of mastering these innovations of theirs. To master the use of a desktop computer by traditional methods, a person "right off the street," even with advanced technical education, would take several weeks. Such a possibility was not open to everyone, by far.

But then this obstacle at the start was taken advantage of by their competitors from the toy industry. Their personal computer--in contrast to the desktop computer--itself took an active part in the teaching and conducted it in the form of a game, and this shortened by several times the time required to attain a fundamental education in computers.

The demand for the "toy" computers began to rise at an explosive rate: in 1981 the total number of them in the USA was one million, in two years--seven million, and already by 1984--twelve million units.

[Q]--Yes, the gap is deeply, deeply serious. To overcome it, it is not enough just to make use of the best of the outside world's experience, we have to propose new, original solutions.

[A]--First, we have to create our own concept of the PC.

Even here, Soviet science and technology policy has been based on the socio-economic superiority of socialism to capitalism. A socialist country with its planned economy, for example, has no reason to create, as in the capitalist world, more than three hundred different designs for a PC.

We have succeeded in implementing the idea of flexible PC architecture. For each line of machines we have created a universal base, and the other components have been designed in the form of easily connectable modules. What you get is something like a tractor chassis, which with a simple change of attachments can be quickly transformed into machines of very different purpose: a bulldozer, an excavator, a loader, etc.

This concept on the part of the scientists at the Institute of Cybernetics has had a double effect. First, the updating of each model does not require a radical retooling of the industry--the modular components will change step-by-step without affecting the "skeleton" of the design. For this reason the average time to obsolescence of the typical Soviet PC model will be 10-15 years, not 2-3 years, as it is among our competitors.

Second, by changing modules, we can satisfy our customers' most varied demands in the different fields of the national economy: for one--a "bulldozer," for another--an "excavator," for a third--a "loader," that is, we can orient the PC towards different professional applications.

From this comes the term "Professional PC."

Automation of design based on the PC, for example, raises the productivity of the labor of a designer approximately by a factor of ten, eliminates technical mistakes, and yields the most economical possible answers to problems of planning and design. All of which, incidentally, are not predictions but actual results already achieved in practice at a number of institutions.

[Q]--We can well imagine the benefits of the use of PC's in general in the economy and in industry. But will this technology be of help in the social sphere? Will it quickly affect our daily life?

[A]--It will be of help and it will have an effect, and much sooner than many people think. PC's are already coming off the assembly lines in commercial quantities. The first few thousand such machines are headed for scientific research institutes, planning organizations and design bureaus, where they will yield the greatest benefits.

But after two or three years PC's will be starting to pop up in other fields. Let's take an example from the well-known field of medical practice. We know that right now most doctors spend about half their time doing various writing tasks: filling out cards, writing prescriptions, doing medical histories, doing accounts, and so on.

All this, you see, could be done on a PC. In addition, for the medical man it could take the place of a whole bookcase full of prescription references and

diagnostic descriptions. Finally, the doctor could himself enter into the machine's memory notes of a professor's lectures at an institution of higher learning or at courses for raising his professional qualifications.

Such an electronic advisor is always ready to carry out a search through all the nooks and crannies of its capacious "memory", and, if it does not find some rarity or other, will itself put in a query at a municipal or regional medical data bank. But now imagine to what an extent this will raise the accuracy and timeliness of diagnoses, and will shorten the waiting lines at clinics and hospitals!

[Q]--But the thing is, we have known about the wondrous possibilities of computers for a long time now. It is also well known that computers are even now being used in medicine, including diagnosis.

[A]--Yes, they are. But still basically in institutions, in large medical complexes. But today we are arriving at the possibility of equipping tens of thousands of regional clinics with electronic equipment, and with time--every doctor's office.

Such access will be guaranteed, above all, by its comparatively low cost: for example, the price of one of the mass-produced PC models is no more than 600 rubles. Other models, depending on their complexity, will sell for prices from about 200 rubles to 5000 rubles.

The most expensive of them--for scientific research--have their own color displays, like the screens of portable television sets. For outputting information onto paper they have a printer, and for input of queries, a keyboard, like those of typewriters. The external memory resides in two small units, each the size of a brick. And that's the whole PC. It can easily fit on a desk. But the simplest ones--home and school computers--do not as yet have their own displays: to get video information we will connect them to television sets.

It is this mass accessibility that constitutes the fundamental difference between the PC and all previous computer technology. Within two or three years personal computers will be in use by hundreds of thousands of people, and in five to seven years the number will be in the millions.

In one word, the hour of mass computerization has struck. But is every industrialist, every head of a government agency, every research engineer ready to meet up with a PC tomorrow? Do we see a role for it and a concrete place for it in the work of our own collective? We will have to quickly find an answer to those questions, in order to make sure that PC's are integrated into our work at a rapid rate and that the successes attained by the scientists and designers are consolidated and further built upon.

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NEW SOVIET SUPERCOMPUTER WITH PARALLEL-PROCESSOR ARCHITECTURE

Moscow NTR: PROBLEMY I RESHENIY in Russian No 8, 21 Apr-4 May 87 p 2

[Article by I. Ivanov: "Prospects for Domestic Supercomputers"]

[Text] A new-generation supercomputer with the "Elbrus" architecture, having a throughput of several billion instructions per second is being built at the Moscow Institute of Precise Mechanics and Computer Hardware imeni S. A. Lebedev. Such high speed is supplied on account of the modular principle of constructing the computer: up to 16 processors can be joined in it.

"Soviet scientists," says G. Ryabov, director of the institute, "hold to their original principle of building a supercomputer. We use a computer architecture of several processors, so that this architecture permits building up practically linearly computational power, depending upon the number of processors. These principles are established in the previous-generation supercomputers, which operate with a 'Cray-type' throughput of 125,000,000 operations per second, and consist of 10 processors."

Current American and Japanese computers are built, as a rule, on the "conveyor" principle--information is processed sequentially, simultaneously in several modules of one processor. They are predesigned basically for processing homogeneous information. Under this scheme, one processor does the work of the computer, with a maximal speed of several billion operations per second. However, as specialists of the Livermore Laboratory in the USA confirm, when solving complex tasks, the throughput of these computers drops by a factor of 3-6.

"The advantage of our principle of multi-processor operation in the supercomputer architecture also attracts American specialists," says G. Ryabov. "They are now developing a computer which will have 16 processors operating."

He noted that the routes of technical decisions in our country and in capitalist countries have similarities and differences.

"The realization of the adopted program for work progress on the supercomputer will, in the very near future, permit us to create modern hardware in this area of computer technology also," thinks the scientist. "In the USSR, a new supercomputer is being built with a speed of 10 billion operations per second,

and higher. We are carrying out serious fundamental research even in the area of improving the component base of the computer, based on new physical principles and materials."

Besides this, G. Ryabov connects the established speed-up of the development of computer facilities with the joining of the efforts of the scientists of the European socialist countries in the framework of the overall program of the scientific and technological process of the member countries of CEMA.

"What will be new in this collaboration is the fact that the different sides are developing not separate computer components, as was done earlier, but entire functional subsystems. Thus, for example, a contract has been concluded with Hungary for completing the "higher level" languages, and with Poland for developing unified power sources for the supercomputers. We place great hopes in the scientists and designers of Bulgaria, Czechoslovakia, and the GDR in connection with the system and hardware development of this series of computers," he said.

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UDC 539.293::534.1, 53.072:681.31

PULSATING AUTOSOLITON AND DRIVING CENTER IN TWO-COMPONENT SYSTEMS WITH DIFFUSION

Moscow MIKROELEKTRONIKA in Russian Vol 16, No 1, Jan-Feb 87
(manuscript received 22 May 86) pp 23-31

[Article by V. V. Osipov, I. I. Lazurchak, B. S. Kerner and V. V. Gafiychuk]

[Abstract] A study is made of the possibility of exciting pulsating autosolitons in two- or three-dimensional active systems with diffusion. The structure and properties of autosolitons are studied. Radially symmetrical static and pulsating autosolitons are analyzed. Figures 5, references: 11 Russian.

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UDC 681.327.2

BD-411 BRANCH DRIVER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan 87
(manuscript received 5 May 85) pp 69-75

[Article by N. V. Gorunov, A. G. Karev, E. I. Maltsev and V. A. Morozov, Joint Institute for Nuclear Research, Dubna]

[Abstract] The BD-411 branch driver is described, supporting data interchange with modules located in 28 crates grouped in 4 branches. Information interchange can be either under software control or by direct memory access. 11 block modes and 1 programmed mode are supported. Users have an individual program method of interchange with the CAMAC system in the block modes to allow organization of more convenient information exchange protocols with CAMAC modules. References 16: 5 Russian, 11 Western.

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CSO: 1863/286

UDC 681.325.6

MOVEMENT-TO-CODE CONVERTER, ITS INTERFACE WITH MICROPROCESSOR SYSTEM

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan 87
(manuscript received 30 Oct 85) pp 76-79

[Article by V. T. Malikov, I. Ya. Khaimzon, A. I. Kachkovskiy and S. L. Chumachenko, Vinnitsa Polytechnical Institute]

[Abstract] A movement-to-code converter is described utilizing sequential counting of pulses. Interfacing of the device through an LSI timer to a microprocessor based on the K580 system is described. The counting interval can be assigned as various numbers of pulses; the maximum movement speed which can be accurately measured is 500 pulses per second. An assembler listing is presented of the operating mode set program and movement detecting subroutine. The subroutine runs in less than 150 μs on a microprocessor with a clock frequency of 2 MHz. References: 3 Russian.

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UDC 681.327.21

MULTIPARAMETER EXPERIMENTAL DATA OUTPUT MODULE

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan 87
(manuscript received 19 Feb 86)p 226

[Article by V. A. Zayka, V. V. Naumov and V. I. Sheleshkevich]

[Abstract] A module is described, designed for program-controlled imaging of the results of input and processing of multiparameter measurement data. The module allows simultaneous rapid monitoring of the data of several measurement devices. Technical data on the module are presented. The module is designed for connection to an "Elektronika-60" computer and measures 252 x 143 x 12 mm^3, mass less than 0.35 kg.

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UDC 539.17

INCREASE IN RESOLUTION OF SPECTROMETRIC TRACT BY PROCESSING EXPERIMENTAL DATA ON A MINICOMPUTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan 87
(manuscript received 18 Nov 85) pp 63-65

[Article by V. A. Voronov, Yu. I. Nechayev and G. P. Pokhil, Scientific Research Institute of Nuclear Physics, Moscow State University]

[Abstract] The mathematics section of the Moscow State University Department of Physics has developed a method of reduction allowing a computer to be used to consider distortions introduced by the hardware function of the spectrometric tract with constant noise level. The method has been implemented on large computers. The authors have now implemented the reduction method for multichannel spectra on a small computer. The program was used to process a number of spectra obtained from multichannel analyzers on a type SM-3 minicomputer. Figures illustrate example spectra, clearly showing the difference in processed spectra from initial distorted spectra. Figures 3, references: 3 Russian.

6508/5915
CSO: 1863/286

UDC 681.327

UNIVERSAL YeS COMPUTER DRIVER INTERFACES FOR ORGANIZATION OF DATA COLLECTION USING BIS-2 FILMLESS SPECTROMETER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 1, Jan 87
(manuscript received 15 Jul 85) pp 65-69

[Article by B. N. Guskov, D. A. Kirillov, A. N. Mo[illegible]v, Joint Institute for Nuclear Research, Dubna]

[Abstract] A description is presented of the IR40-1 and IR40-2 electronic modules and accompanying software, used to create a distributed computer system based on a YeS-1040 computer, a PA-1001i minicomputer and a Tektronix 4051 graphic system with built-in microcomputer. The modules placed in the universal driver provide an interface between the universal driver and the microprogram

panel controller, support data interchange between the YeS-1040 and TRA-1001i, data storage in YeS-1040 memory under the control of programs on the TRA-1001i, and data conversion and compression. The modules and their software are described. Figures 3, references: 4 Russian.

6508/5915
CSO: 1863/286

LACK OF COMPUTERS IN AGRICULTURE

Kishinev SOVETSKAYA MOLDAVIYA in Russian 24 Mar 87 p 1

[Article by D. Dimchoglo, correspondent of ATEM, entitled "Where Can We Get Computers? Solutions Are Needed"]

[Text] The contract prompted the laborers of the "Progress" kolkhoz of the Kutuzov rayon to think about acquiring a computer. With its introduction in all subdepartments of this large multi-sector concern, there has sharply increased the quantity of the various calculation operations which economists are meanwhile still executing on the usual abacuses or the simplest calculators.

But the dream of the kolkhoz specialists will not come about soon. As they reported to the ATEM correspondent in the republic's State Agricultural Bureau [Gosagroprom], the needs of farms and enterprises of the agro-industrial complex [APK] for computer hardware are barely 25-30% satisfied.

"In the twelfth five-year plan for wide introduction of automated systems for control of technological processes [ASUTP] and production [ASUP], it was suggested that we acquire 5 mainframes and approximately 70 mini-computers, and 450 personal computers," says V. P. Ivanenko, chief of the division responsible for introducing automated control systems [ASU] and the informational and computational maintenance of the APK. "Unfortunately, all our requests are 'cut' by a factor of two or three by the USSR Gosagroprom even though, because of the wide introduction of the contract and of cost accounting, the needs of the farms and enterprises for computer hardware have become even higher than they were a year or two ago, when we turned in the requisitions."

The scientific-production associations and sovkhoz-technical schools need them especially keenly, where the computers could speed up the creation of new urgent developments for agriculture, and improve the preparation of highly-qualified specialists for contemporary agro-production. Now computers are supplied first to the newly introduced organizations, but even then not to all. For example, the Brichanskiy sugar plant, the largest in the republic, which last year had its first production, according to the plan must have two computers for controlling the technological process and production. But the sugar makers have not yet received the second computer, so that the introduction of the ASUTP is threatened. And without it even the most modern plant is almost a manual trade.

Under these conditions, there is the natural inference that we must more effectively use the computer hardware that we do have. But even here there arise problems. It appears that acquiring the hardware is only half of the problem. A path through the gauntlet awaits the fortunate owners of the computer. They begin with developing programs for the "brainless" machines; for practically all computers come to the customers without professionally oriented application programs. Many ministries and departments are working on developing them. But as a rule, the customer pays 5 to 6 times more for them than the machine itself costs.

Specialists of the republic's Gosagroprom, who are working on questions of introducing computer hardware into the APK, are unanimous in the opinion that in order to arrange in an ordered manner this work, which is important for the economy, there could be specially set up in the country a State Committee (Goskomitet) for computer hardware and informatics. It would have to coordinate the work of the ministries in program development and unify them, so as to make the computer more accessible for all plants and facilities. After this it ought to take care of creating a single repair service for all types of computer hardware.

But for now all this is in the realm of wishes. The problems which have been named require solutions even in the offices of the republic. For example, specialists with good reason consider it expedient to create an inter-departmental periodical which would take on itself the coordination of questions which are connected with the acquisition, rational use, and repair of computer hardware. This frees the plants and facilities from the necessity for each one to handle the given problems in isolation.

13264/5915
CSO: 1863/278

CLASSIFIERS AND DOCUMENTS: A COLLECTION OF SCIENTIFIC AND TECHNICAL ABSTRACTS

Moscow KLASSIFIKATORY I DOKUMENTY in Russian No 3, Mar 87 pp inside cover, 1-21

[Annotation, table of contents, and the full text of a collection of abridged articles, "Classifiers and Documents: A Collection of Scientific and Technical Abstracts," published as issue 3 of a monthly series by All-Union Scientific-Research Institute of Technical Information, Classification and Coding [VNIIKI] of Gosstandart; 21 pages, 2800 copies]

[Text] **Inside Cover**

Editorial board: O.A. Chertishchev, executive editor, N.N. Fedotov, candidate of technical science, deputy executive editor. Members of editorial board: I.A. Almazov; V.A. Arkhipov; Yu.N. Bernovskiy, candidate of technical science; L.B. Venchkovskiy, candidate of technical science; V.A. Vinogradov; V.A. Zakharov, candidate of technical science; V.A. Zverev, candidate of economic science; N.D. Ivanov, candidate of economic science; A.I. Karpenko, candidate of technical science; A.Yu. Kurayev; A.M. Margulis, candidate of technical science; I.P. Markov; Yu.A. Mikheyev, doctor of economic science; N.Ya. Pivkina; R.A. Sergiyevskiy; G.P. Simakova, candidate of economic science; S.V. Sinyutina; V.A. Sokalskiy; S.L. Taller; G.A. Shastova, doctor of technical science; and E.L. Sonechkina, candidate of technical science and executive secretary. Managing editor responsible for the issue: A.I. Karpenko. Editor: N.A. Chuvilskaya.

The materials have been prepared by the Chief Scientific Research Center for Maintenance of All-Union Classifiers [GNITsVOK]. Received by VNIIKI [All-Union Scientific Research Institute of Technical Information, Classification and Coding] on 10 Jan 1987.

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Section I. Development and Introduction of Classifiers and USD

UDC 025.4:658.512.2:681.3:002

HARDWARE SUPPORT FOR THE INTRODUCTION OF ESKD [UNIFIED SYSTEM OF DESIGN DOCUMENTATION] CLASSIFIER

[Article by by R.V. Tverditskiy, candidate of technical science, and A.I. Karpenko, candidate of technical science, GNITSVOK (pp 1-5)]

[Text] One of the main purposes of the ESKD Classifier [K-ESKD] is to facilitate the wide use of computer technology in the design, technological preparation and manufacture of products, and also in automating the development of design documents and industrial processes [1, 2].

In order to intensity the efforts in the introduction and maintenance of K-ESKD means must be created for computerizing the K-ESKD maintenance functions and providing information support to specialists (designers, process engineers, experts and managers) who are the users of the classifier and of the information and reference databases associated with it, i.e., it is necessary to develop a computerized worksite [ARM] for the expert, designer, etc. [3, 4].

The main functions of the software-hardware complex of an ARM are the following:

maintenance of the classifier files, including the graphics sections;

maintenance of the reference information files associated with the classifier;

extraction of reference information from classifier and reference information files (including computerized search for K-ESKD codes);

maintenance of the classifier update files and reference information files; computerized processing of texts of shipment letters, instructions and technical manuals;

maintenance of the file of descriptions of design documents; and extraction of reference data from the file of descriptions of design documents.

The classifier files are the files of classes, alphabetic subject indexes, lists of abbreviations and notations, lists of terms and interpretations and an illustrated index of components.

The reference information files, above all, include lists of leading organizations responsible for K-ESKD maintenance and introduction and lists of organizations responsible for the development of the individual classes of the classifier.

The update file contains records with texts of changes that have been approved and formatting specifications (type of change, date of approval and introduction, name of the file being updated, etc.).

One or several libraries with texts of typical documents are organized for computerized processing of texts in the RAM memory of ARM. Work with texts includes maintenance of libraries (initialization, actualization, placement into archives, compaction and recovery) and searching and formatting of documents.

The sets of data containing the descriptions of the design documents available for analysis and use are organized for maintaining the file of descriptions of design documents; the key code of a document includes its K-ESKD notation as a component part.

The query system serves to extract reference data on the contents of the classifier files, reference files, update files and library of texts and descriptions of design documents.

The query system is the main system serving the user--designer, process engineer or expert--and it should include facilities for content-based search for the code of a classification group.

Three principal methods are employed to computerize classification maintenance and use:

creation of a specialized software-hardware ARM complex based on a microcomputer or a personal computer and facilities for interfacing ARM with a computer complex maintaining the main database of project, design and industrial process documentation and constituting the hardware base of the SAPR [computer-aided design], STPP [system of technical preparation of production], IPS [information retrieval system] and ASTsVK [not further identified];

the use of the hardware of the ASU [automated management systems] of enterprises; supply for these facilities of the necessary peripheral devices, including graphics terminals; the creation (or adaptation of existing) application program packages for control of databases (containing K-ESKD information, including graphics information, and reference files), the query system, the automated processing of texts and the information retrieval system; arrangements for informational links between software complexes of SAPR, STPP and ASU; and

modification of the existing designer ARM--to include the K-ESKD files into the information support component--and development of programs for maintenance and use of these files, similar to the existing software of the ARM.

The above-mentioned methods of computerized maintenance and use of K-ESKD are outlined below.

The first method has the following characteristics:

the specialized software-hardware complex of ARM is a standardized facility which can be used at all levels of the hierarchical system of K-ESKD maintenance and utilization;

the ARM can be employed both as a stand-alone system (producing the desired information from machine carriers or video terminals) or as an intelligent terminal connected to a mainframe computer in an organization;

when ARM operates as an intelligent terminal, this minimizes the workload of the main computer facilities, as the bulk of the functions in serving the users in a conversational mode are performed by the ARM complex; and

ARM can be easily interfaced with the existing systems--ASU, SAPR and others.

The second method is characterized by the following features:

it can only be implemented at enterprises equipped with modern computers;

compared with the first method, the hardware cost is lower (only additional peripheral devices are needed); and

the cost of software is increased because it requires additional customized adaptation of programs at each enterprise (assuming the diversity of hardware) and the interfacing of these programs with the existing program complexes.

The characteristic features of the third method are the following:

it can only be implemented at enterprises equipped with designer ARM;

at those enterprises concerned exclusively with K-ESKD maintenance (in particular, GNITsVOK), a large part of designer ARM hardware (plotters, transparencies, etc.) will remain unutilized; and

no additional work on the hardware is required and the cost of the software adaptation is reduced.

A comparative analysis of the above methods of computerization suggests that it would be efficient to develop the ARM for an expert (respectively, designer, reviewer, etc.) as a standardized hardware-software complex based on a microcomputer and applicable at any of the nodes of the hierarchical system of the maintenance of K-ESKD and its primary utilization.

All operations in computerized maintenance of the classifier--extracting information from it, peforming automatic text processing, searching for design

document descriptions and exchange with other systems--should be constructed with the maximum possible use of paperless electronic processes.

By automating the functions of experts and information services to specialists it will be possible to improve the reliability of information, speed up data updating and simplify the processes of extracting information from the classifier and reference files (as compared with the system of manual nonautomatic K-ESKD maintenance and use).

With the computerized system it will be also possible to improve the productivity in the preparation of textual information (standard letters, instructions and methods manuals) and in the search for description of design and industrial process documents.

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THE PRINCIPLES OF UNIFICATION AND THE APPLICATION AREA OF COMPUTER GRAPHICS FACILITIES OF ESKD CLASSIFIER

UDC 025.4:658.512.2:002(084)

[Article by V.K. Pogrebnoy, doctor of technical science, G.N. Tarusin, Tomsk Polytechnical Institute, and M.A. Sonkin, candidate of technical science, Tomsk Subsidiary of GNITsVOK (pp 5-7)]

[Text] The ESKD Classifier [K-ESKD] differs from other classifiers in that it offers a graphic representation of the types of products in several classes (illustrated index of components of classes 71-76 and list of terms and interpretations adopted in classes 71-76). In the development of a computerized K-ESKD maintenance system, the existence of images of the classification objects on the one hand helps improve the efficiency of the conventional uses of the classifier for the design of components and, on the other, makes it possible to substantially expand the spectrum of functions that can be performed with the aid of computer graphics.

Four functionally related areas of ESKD Classifier utilization can be identified where the need for computer graphics is acute.

The first area is that of the work of the expert of a leading organization responsible for K-ESKD maintenance. The functional capabilities of the computer graphics of an expert's computerized worksite [ARM-E] should include a facility for charting the graphs of functions in the solution of statistical problems that comprise part of the ESKD maintenance effort, entering sketches

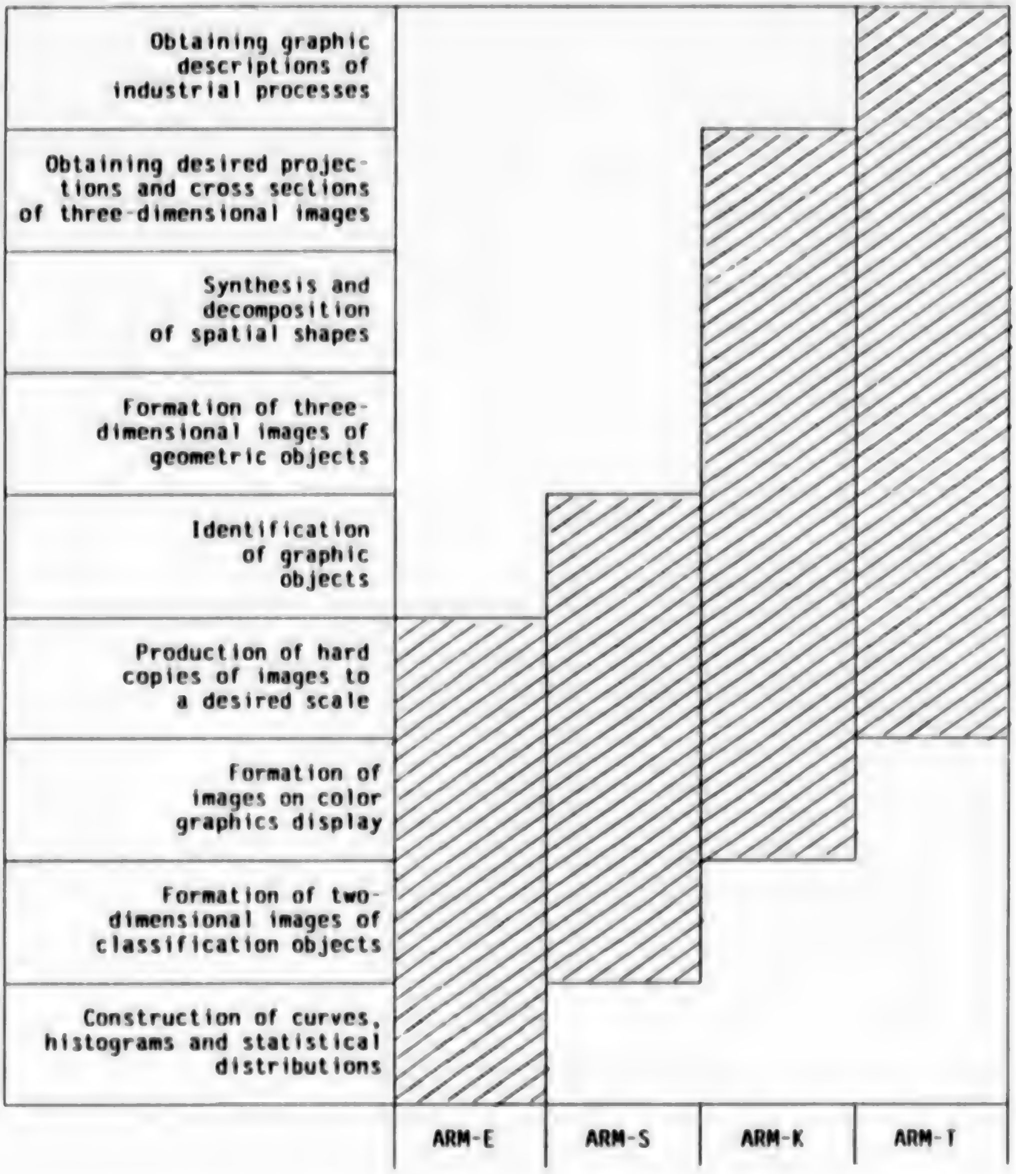

Figure 1. Schematic diagram of the distribution of the main functions of computer graphics facilities.

according to the illustrated index of components, forming images on the color graphic display in the course of conversational interaction with the system and generating hard copies of component images.

The second area should satisfy the computer graphics requirements of the staff of leading organizations, ministries and departments according to their specializations. The computerized worksites for specialists [ARM-S] being created for this purpose will be able, in addition to the graphics functions of the ARM-E, to identify images from the existing graphic database in order to define the codes of new products as part of the work in reviewing the proposals submitted by the enterprises and performing expert examinations.

The next area of computer graphics uses is the design of components. The requirements for the functional capabilities of the graphic tools of the computerized worksite of a designer [ARM-K] are greatly expanded as compared with those of an ARM-S. The set of basic functions should be such as to enable the user to form three-dimensional images, perform synthesis and decomposition of images in the construction of assembly blueprints and obtain the desired projections and cross sections of three-dimentionsal geometrical figures.

Finally, the fourth area is the technological preparation of production, for which a computerized worksite of a process engineer [ARM-T] is to be constructed. The principal functions implemented by computer graphics in this case are the production of industrial process drawings of components and assembly units and the formation of graphic descriptions of industrial processes (including programs for ChPU [computerized numeric control] machine tools). The formatting of the drawings and graphics documents are done so as to conform with the results of operation of the machine graphics of ARM-K.

The functional interconnections of ARM-E, ARM-S, ARM-K and ARM-T and the main functions of computer graphics facilities are schematically illustrated in figure 1.

For ensuring the functional continuity of the computerized worksites of these types it is necessary, first, to secure a complete unification of computer graphics software [1, 2] and, second, to ensure that these programs be invariant with respect to the hardware used.

The main problems of unification of the software for interactive computer graphics of K-ESKD are the following: development of mathematical models of the operation of the graphics systems of ARM; formation of sets of standard functions for the input and output of graphics information; selection of the basic graphics functions of ARM; and formation of flexible linguistic tools of description and manipulation of graphics objects.

As of now, the functions of illustrative computer graphics for ARM-E have been implemented in the form of computer programs. Experimental work was conducted with the use of a color graphics monitor which is part of the hardware of SM-4 mini- and microcomputers with the system of commands.

Implementing this approach of technological compatibility of ARM-E, ARM-S, ARM-K and ARM-T on the basis of a large-scale use of computer graphics will be helpful in coordinating the efforts of the maintenance of ESKD Classifier and its use at enterprises.

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ILLUSTRATIVE COMPUTER GRAPHICS FOR ESKD CLASSIFIER

UDC 084:658.512.2:025.4

[Article by G.N. Tarusin, Training Research and Production Complex Kibernetika [Cybernetics], Tomsk, UDC 084:658.512.2:025.4 (pp 8-10)]

[Text] In computer applications for ESKD Classifier [K-ESKD] maintenance, two basic functions must be performed: formation, storage, updating and retrieval of textual descriptions of sketches; and construction, accumulation, correction and reproduction of sketch illustrations. This separation of tasks is due to the fact that, first, the existing computers have a better-developed system of peripherals and a better mathematical software for processing of textual messages than for graphic images; second, the set of necessary graphic symbols and their combinations is much larger than the set of alphanumeric symbols and their combinations in texts; and, third, the method of representation of graphic symbols in the memory and their storage and retrieval are still in the stage of experimental research.

One approach to the last of these tasks is based on SM-4 computer facilities combined with a graphics monitor which can display on the screen an eight-color image of 256 x 256 pixels; this approach is described below.

The analysis of textual and graphics sections of the classifier and trial runs on a model system suggests that the resource and speed of this computer and the resolution of the graphics monitor are quite sufficient for performing the entire set of functions confronting an expert responsible for the maintenance of the graphics component and the textual component of the classifier.

Illustrations of prototype objects in the classifier are presented in the form of static sketch projections and can thus be described by mathematical two-dimensional graphics in integer screen coordinates. Since there are several thousand sketches in some of the classes, the method of packaging and storing them in the computer memory is important. It is convenient to store illustrations in a separate "graphics file" (a film) on a magnetic disk with direct access to each illustration (frame). The need for storing the graphics file separately from the textual description of the prototypes is dictated by the specifics of the technology and the procedures of operation with graphics objects. This principle does not interfere with combining graphics and text descriptions and can be helpful for separate uses of descriptions and in case of equipment failure.

The point-by-point storage of an eight-color image in the computer memory requires even for a single frame of 256 x 256 pixels a substantial memory resource, attaching special importance to frame packaging. An economical method of image description uses reference to programs of generation of graphics primitives from given reference parameters: coordinates of the points of the screen, angles, lengths, the colors of lines, their thickness, etc. With this method, a fairly complex picture can be packed in a memory space of 1K, while a representation of the same picture point-by-point would require 64K. This method of image packaging has been tested successfully on the prototype model of expert worksite [ARM-E], which used for the graphics primitives the conventional elements of graphics employed by designers in drawings and sketches: straight lines, vectors, circles, ellipses, arcs, points, symbols, texts, broken lines, color surfaces, hatchings, polygons and other "electronic French curves," which can be used to generate on the screen any of the classifier sketches using techniques similar to French curve drawing on graph paper. With this method, the reproduction time of even a complex drawing does not exceed 2 s.

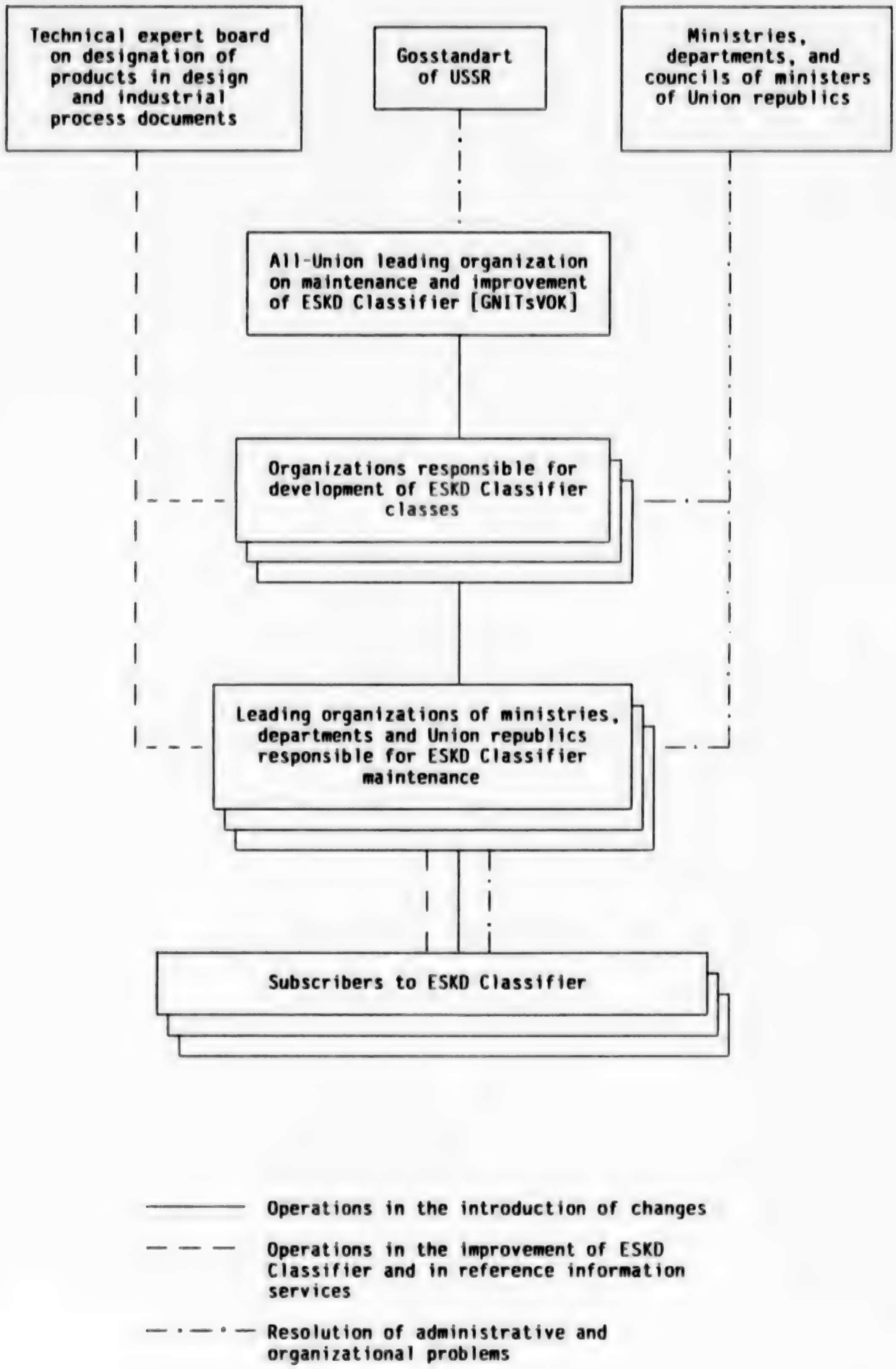
For entering images into the computer (in ARM-E) the expert is provided with the language of image design, a text editor and a translator of text descriptions into the graphics file.

The image design language is simple and formally similar to the natural language of a designer. Each graphic element of a drawing is defined by a text sentence specifying the type and place of the element on the monitor screen. The set of sentences of the language is open-ended and is defined by the spectrum of the programs of generation of graphics primitives, which can be expanded indefinitely to improve the constructive capacity of the language.

With the textual method of image representation, any of the existing computer text editors used in the writing of programs can be used for design. With editor software it is possible to enter the textual description of a frame, a group of frames or the entire film into the computer, correct errors, rearrange sentences or repeat them, connect or separate descriptions of images of the different frames of the film and assign identification names to frames or the film.

The textual description of the graphics objects of the classifier coincides in form with the description of classifier sketches. This makes it unnecessary to develop two separate editor programs--textual and graphics--relieving the expert of learning two such programs.

The use of the text editors in the form used for program design, however, has a shortcoming in that the computer verification of the text is postponed until the end of the editing procedure, for which purpose other programs of the mathematical software are used. It would therefore be desirable to supplement the text editor with means of current graphics reproduction of primitives on the monitor screen for verification purposes.


Technical expert board on designation of products in design and industrial process documents
Gosstandart of USSR
Ministries, departments, and councils of ministers of Union republics
All-Union leading organization on maintenance and improvement of ESKD Classifier [GNITsVOK]
Organizations responsible for development of ESKD Classifier classes
Leading organizations of ministries, departments and Union republics responsible for ESKD Classifier maintenance
Subscribers to ESKD Classifier
Operations in the introduction of changes
Operations in the improvement of ESKD Classifier and in reference information services
Resolution of administrative and organizational problems

The textual description of classifier illustrations in the input language is converted in a compact machine form in the graphics file by the language translator. In the course of the translation, syntactic and semantic verification of language sentences is performed, the sentences are reencoded, or replaced by commands which summon the corresponding programs for generation of graphics primitives; these are composed into frames and organized into the graphics file.

A special program reproduces graphics illustration on the monitor screen. Its functions are receiving from the control program the frame name (the classifier code), finding it in the graphics file, loading it into the RAM memory and initiating the commands, and summoning the programs which generate the graphics primitives on the monitor screen.

The simultaneous operation of the programs reproducing graphic illustrations and text descriptions makes it possible to obtain on the screen of the text terminal the verbal description of the prototype, while its sketch illustration appears on the color montior.

For expanding the facilities of computer graphics it would be desirable to supplement the program package with a library of fragments of typical elements of graphics objects. In the course of constructing a frame, an expert would be able to enter recurring fragments into the library, which could then be called when needed. A library fragment should include the textual description of its graphic primitives, reduced to a certain system of coordinates, assigned to the library (or its fragment) and referenced to a point in a fragment. Each time it is called from the library the text of a fragment would be adjusted to the position in a plane specified by the expert and included into the general text of description of the frame. The adjustment of the fragment text consists in spatial transformation of the coordinates of the primites of the fragment into the screen coordinate system with respect to the point where the fragment should be placed as specified by the expert.

This version of computer graphics facilities (without the library of fragments) has been tested in a experimental prototype of ARM-E on IRZAR-60M and SM-1403 computers. For the trial text, descriptions of all prototypes of one class of components and approximately 100 illustrations of classification objects were generated; the methods of preparation, the necessary space and time of reproduction of frames in the course of operation were estimated. All software components were found to have sufficient productivity, reliability and convenience. The illustrative computer graphics facility can be used not only for maintenance of the classifier but also for other purposes, such as creation and reproduction of diagrams, graphs, functional and electric circuits; simulation of three-dimensional and space motions, illustrations for "electronic books," manuals and handbooks; and accumulation and reproduction of all kinds of information that lends itself to imaging in eight colors on a field of 256 x 256 pixels.

ON SOME ASPECTS OF THE INTRODUCTION OF ESKD CLASSIFIER (A TOPIC FOR DISCUSSION)

UDC 025.4:658.512.2:002

[Article by G.V. Kudryavtsev, candidate of technical science, and V.N. Pichikin, GNITsVOK (pp 11-14)]

[Text] The importance of an efficient organization of information files is greatly increased in the environment of an acceleration of scientific and technological progress. In these conditions the ESKD Classifier [K-ESKD] is to occupy an important place; the preparations for introducing this classifier are now nearing completion.

The full potential of the Unified System of Design Documentation [ESKD] can be fully realized only if a unified system of notation of products and design documents is introduced. The multitude of notation systems currently in effect contradicts the essence of ESKD.

The introduction of a unified generic system of notation for products and design documents based on K-ESKD will provide a basis for developing improved designs of products, promoting unification of equipment and acessories and creating conditions for greater specialization in industry, helpful in the overall improvement of product quality on the basis of standardization and unification. With the use of K-ESKD, conditions will be created for solving a large number of design, technological, economic and other problems [1].

The introduction of K-ESKD, however, will involve certain additional investment, abandonment of conventional systems of notation and reorganization of archives of design documentation.

The merits of K-ESKD are the following:

the broad coverage of products of the main and auxiliary industries in all sectors of the national economy covered by design documentation;

the construction of a classifier based on features tailored to the interests of a designer: the functional and constructive principle of operation, the parametric description, the geometric shape, etc.;

a double system of search for classification groups (with alphabetic subject indexes and with consecutive matching of the features of products with classification groups in grids of subclasses and groups and then in classification tables); and

detailed descriptions of the characteristics of products in the form of numeric codes.

K-ESKD can become a universal tool of a designer, providing the necessary information on previously created products and promoting a broader use of computer technology.

According to USSR State Standard GOST 2.501-68, design documents are stored in the sequence of increasing numeric values of codes. With the use of the classification characteristic according to K-ESKD in the code, the search of design documents can be greatly facilitated, creating conditions for a large-scale adoption of previously created designs and prevention of duplications of design effort.

Making the existing blueprints for similar products more accessible to designers, K-ESKD will thus free their time for creative work or for finding additional information.

If K-ESKD is used as a searching tool, the information about inventions and innovator proposals will become more accessible to designers.

Information files must be organized on the basis of K-ESKD; another alternative is to compile transition card files which will make use of the codes of the classification characteristics according to K-ESKD to yield the maximum information about products.

An optimal structure of the archives of technical documentation is one where a designer, proceeding from the code of classification characteristics according to K-ESKD, can obtain any information on the products stored in the design document archive, standard article catalogues, charts of technological standards and product quality, etc.

In the transition from object-based notation systems to a generic system, a question can be asked: How can one determine whether a certain component of a product denoted in terms of the generic system belongs to a particular article?

For this purpose one can use, in addition to specifications, cards of document recordkeeping described in GOST 2.501-68. At the first use of a blueprint and at each subsequent use, a notation should be posted in the recordkeeping card indicating the application of the drawing and specifying the code of the product in which it is used (according to GOST 2.201-80).

These applicability data are also necessary for the work on product unification. In this connection, it is desirable to extend the requirement of GOST 2.501-68 concerning the presentation of document recordkeeping cards to all documentation encoded according to K-ESKD, including design documentation for auxiliary and single-unit manufacturing.

The cost of K-ESKD introduction is quite insignificant compared with the economic effect and the potential that its use offers to industry.

Several specific proposals on reducing the costs and surmounting the psychological barrier in the transition to a unified generic system of coding have been given, for example, in [2]. This includes the development of transition tables from the existing in-house enterprise classifiers to K-ESKD and the use of selections from K-ESKD in the nomenclature of products developed by the enterprise. Such selections also facilitate the search for classification

characteristics and reduce the amount of work involved in classifier revisions.

The following suggestions will help improve the system of K-ESKD maintenance.

As an extension of recommendation RD-50-166-86 and in order to achieve uniform and complete revision of K-ESKD, detailed descriptions should be prepared of the changes introduced into the classification tables and the related structural parts of classes (alphabetic subject indexes, indexes of product names, etc.). These changes should be presented in the form of positions in the parts of the class affected.

The records of the changes in the classification tables should rule out ambiguous interpretation and have the following form (inclusion of species groups of subgroup 382120):

382120 Steam Engines

<table>
<tr><td>382121</td><td colspan="2">Single-stroke expansion</td></tr>
<tr><td rowspan="2">2 Unilateral
3 action</td><td rowspan="2">Two-stroke expansion</td><td>compound</td></tr>
<tr><td>tandem</td></tr>
</table>

The problems of elimination or annulment of classification groups are debatable. There have been suggestions that the directive in question does not apply to K-ESKD, since when a classification group is eliminated from a classifier it may already have been used for designation of large numbers of design documents, which in turn could have been incorporated in sets of blueprints, specifications, etc.

The main purpose of the directive of "elimination" is to prevent duplication of classification groups and ambiguous assignments of codes to classification characteristics. Elimination of classification groups should thus be interpreted as a prohibition of further use of these classification characteristics to denote new design documents, but not necessarily a change of notation in the documents already prepared.

The recordkeeping card of notation according to GOST 2.201-80 in such instances should include comments specifying which classification characteristics should be used to denote the products in question.

The implementation of the proposals concerning the use and maintenance of ESKD Classifier will make it possible to utilize it on a broader scale and more effectively.

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Section II. Maintenance of Classifiers and USD [Unified Documentation System]

SPECIFICS OF THE MAINTENANCE OF ESKD CLASSIFIER

UDC 025.4:658.512.2:002

[Article by N.G. Kamenetskaya, T.P. Kolesnikova and V.Ya. Fedorchenko, candidate of chemical science, GNITsVOK (pp 15-18)]

[Text] Starting in 1987, ESKD Classifier will begin to be introduced into sectors of the national economy; the classifier is a component of the Unified Generic Classification System for Designation of Products and Design Documents according to USSR State Standard GOST 2.201-80, "ESKD: Designations of Products and Design Documents." The classifier will be introduced on the basis of its trial uses in several industries, which have helped elaborate the methods for its introduction and maintenance.

The methodological base for maintaining the ESKD Classifier in a current state is the Regulation on the Maintenance and Improvement of ESKD Classifier [RD 50-166-86], which is to supersede the methodological document "Maintenance of ESKD Classifier" [RD 50-166-79].

The Regulation on the Maintenance and Improvement of ESKD Classifier consists of the following sections: "General Aspects"; "The Structure of the System of ESKD Classifier Maintenance and Improvement"; "The Functions of Organizations Taking Part in the Maintenance and Improvement of ESKD Classifier"; "Procedures for Collecting Proposals on Introducing Changes into ESKD Classifier"; "Procedures for Review, Presentation, Coordination and Approval of Proposed Changes of ESKD Classifier"; "Procedures for Notification of Approved Changes of ESKD Classifier"; "Procedures for Entering Changes Into ESKD Classifier"; "Procedures for Submitting Requests and Responding to Requests on Maintenance and Improvement of ESKD Classifier"; "Improvement of ESKD Classifier"; and "Recordkeeping of Documents on ESKD Classifier."

The structure of the maintenance of K-ESKD is illustrated by fig. 1. The operations in classifier maintenance include the following:

collection, scientific and technical expert analysis, coordination and approval of changes of K-ESKD classes;

maintenance of reference standards and master and working copies of K-ESKD classes and reference information files;

notification of the organizations concerned as to changes introduced into classes and reference information files; and

reference information services on K-ESKD maintenance and improvements.

The All-Union leading organization responsible for K-ESKD maintenance and improvement is GNITsVOK. The center performs the following functions:

general management, coordination and supervision of the operations at the leading organizations of ministries, departments and Union republics on the maintenance and improvement of K-ESKD;

creation and maintenance of a cumulative reference standard and reference information files of K-ESKD;

collection, scientific and technical expert analysis, coordination and approval of notifications of changes in K-ESKD;

keeping records of notifications of the changes in the classes and reference information files of K-ESKD;

circulating the approved notifications to development organizations;

publishing bulletins of notification of K-ESKD changes and circulating them to leading organizations of ministries, departments and Union republics concerned with K-ESKD maintenance and organizations responsible for the development of individual classes;

supervision of the maintenance of master copies of class schedules by leading organizations of ministries, departments and Union republics responsible for K-ESKD maintenance and organizations responsible for the individual classes;

coordination of specialized departmental and Union-republic methodological materials on K-ESKD maintenance;

organizing promulgation and reprinting of the schedules of classes, the illustrated index of components and other parts of K-ESKD;

delivery of responses to single-time requests from the leading organizations of ministries, departments and Union republics concerning K-ESKD maintenance;

development and introduction of an automated system for maintenance of a cumulative reference standard and reference information file for K-ESKD; and

preparation for the sessions of the board of technical experts on designation of products and design and industrial process documents as associated with improvement of K-ESKD.

The leading organizations in ministries, departments and Union republics responsible for K-ESKD maintenance are to perform the following functions:

development (refinement), coordination with GNITsVOK and approval of specialized (respectively, departmental or republic-wide) methodological materials on K-ESKD maintenance;

organizational and methodological guidance to K-ESKD subscriber enterprises concerning the maintenance and improvement of the classifier;

maintenance of master copies of schedules of classifier classes;

creation and maintenance of reference information files;

supervision of the keeping of master copies of schedules of K-ESKD classes by subscriber enterprises;

supply of copies of classifiers to subscriber enterprises;

review of proposals on changes of K-ESKD classes and tranfers of these proposals to organizations responsible for the development of the respective classes;

notification of subscribers as to changes in the classifier; and

reference information services to subscribers.

The organizations responsible for the maintenance of K-ESKD classes have the following functions:

submitting to GNITsVOK reference standards of K-ESKD classes developed;

maintenance and recordkeeping of master copies of the schedules of the classifier classes for which they are responsible;

collection, expert review and coordination of proposals on changes in K-ESKD classes as received from the leading organizations of ministries, departments and Union republics; and

participation in discussions on promulgation and reprinting of schedules of K-ESKD classes.

The regulation of the maintenance and improvement of K-ESKD defines the general procedures and methods of work of leading organizations of ministries, departments and Union republics on the maintenance of K-ESKD and the work of organizations responsible for the development of the individual classes of the classifier. The procedures for maintenance and improvement of the classifier by enterprises and organizations are to be established by specialized (respectively, departmental or Union-republic) methodological guidance materials currently being developed by most such leading organizations.

In conjunction with the publication of RD-50-166-86, changes must be introduced into specialized (and departmental and Union-republic) methodological materials. Gosstandart has set the deadline for completion of this work: 1 Jul 1987.

GENERAL DIRECTIONS OF WORK IN COMPUTERIZED MAINTENANCE OF ESKD CLASSIFIER

UDC 65.011.56:025.4:658.512.2:002

[Article by R.V. Tveritskiy, candidate of technical science (pp 19-21)]

[Text] The development of ESKD Classifier [K-ESKD] and efforts in its improvement are conducted with a view to the uses of this classifier as a source of information in support of computerized systems for production of design documents and industrial process development [1, 2].

For this purpose, the computerized systems should contain sets of data, including the information of the classifier and auxiliary data sets necessary for keeping the main sets up-to-date, as well as hardware and software for information services to system users.

By now it has become necessary to develop facilities for computerized performance of the functions carried out by experts in maintaining the classifier and by specialists who are its users (designers, process engineers, inspectors, staff of the information units of ASU [management automation systems], etc.).

The principal functions of the computerized system of K-ESKD maintenance [ASV K-ESKD] and information services to users are the following:

updating the information files of the classifier, including its graphics departments and information reference files associated with the classsifier;

producing reference information from the files of the classifier and from reference information files; and

processing on computer the texts of shipment insert letters, manuals and methodological guidance materials.

The main programming system of ASV K-ESKD for designers, process engineers and inspectors is the reference system, which includes the means for searching for the codes of classification groups in the classifier and the characteristics of information reference files.

In its structure the K-ESKD is similar to other All-Union classifiers of technical-economic information [OKTEI] which are being maintained by computerized systems. The main difference of K-ESKD from other OKTEI is that it has graphics sections (illustrated index of components for classes 71-76; terms and interpretations of classes 71-76).

K-ESKD maintenance can be supported by the databases of OKTEI (which should contain all K-ESKD information, including graphics sections), implemented in the hardware of computerized classifier maintenance systems with the use of programming, methodological and organizational components developed previously. Similarly, it is recommended that leading organizations utilize for K-ESKD maintenance the software and hardware of specialized computer OKTEI maintenance systems or other specialized information systems.

For information services to users (and delivery of these services) the main tools of K-ESKD maintenance must be expanded: This involves the creation of computerized worksites [ARM] for experts in K-ESKD, also intended for use by designers, process engineers and other specialists using K-ESKD data. Computer graphics facilities are included in these worksites.

The standardized hardware-software ARM complex can be used as an intelligent terminal of a mainframe, where the database is kept at the GNITsVOK level or at the level of leading organizations; they can be used alternatively as stand-alone information systems at the level of system subscribers--K-ESKD users.

For the large-scale of introduction of ARM they must be inexpensive and affordable. As the hardware base, microcomputer or personal professional computers can be used effectively. ARM should satisfy the information needs of K-ESKD users and classifier maintenance experts, serve as a tool for automation of management (keeping various files and obtaining reference information, processing on computer the texts of standard letters, methodological guidance materials, etc.); they should also have sufficient memory reserves and computer power for further development of the user applications software. In view of the limitations of external memory of the microcomputer, it is admissible to divide large databases and program libraries into sections, to be kept on interchangeable magnetic carriers. In a similar way, with magnetic carriers, exchange of data and software between stand-alone ARM installations can be organized.

With interchangeable magnetic carriers of information files and software, ARM can also be used to operate with other classifiers of technical-economic information.

Automation facilities for K-ESKD maintenance and information services to users are currently being developed on a large scale.

With the use of automation facilities it will be possible to improve the reliability of information, to introduce changes more rapidly and to facilitate access of users to the data in the classifier.

The overall effect from the use of the facilities automating the work of experts on K-ESKD maintenance and the specialists who use the classifier will be seen in improved labor productivity, reduced number of personnel involved in routine operations and, equally important, produce social results such as improving work culture and enhancing professional prestige and skills.

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9922
CSO: 1863/267

UDC 65:681.3

ORGANIZATION OF TECHNICAL SERVICE SECTIONS FOR LINE EQUIPMENT SHOPS USING 'SVYAZ-I' COMPUTER SYSTEM

Moscow OTECHESTVENNYY OPYT V OTRASLI 'SVYAZ.' SERIYA: EKONOMIKA, PLANIROVANIYA UPRAVLENIYA. EKSPRESS-INFORMATSIYA in Russian No 3-4, 1987 (signed to press 7 Jan 86) pp 10-12

[Article by V.S. Furdylova and P.V. Kondratyev]

[Text] The automated technical service section (ASTO), developed step by step in the line equipment shop technical service division of the Moscow Technical Center for Communications Trunk Management takes the form of a set of hardware and software that perform the following functions at the present time: continual data retrieval on the status of line circuits and equipment; real-time display and documentation of the data; monitoring the correction of faults; recording the site of a fault when the equipment signaling ("Tekh.") actuates and providing the on-line technical service personnel with service communications.

The necessity of creating the ASTO was dictated by the following factors: the lack of work stations for on-line technical personnel, the fact that service communications are scattered among the line equipment shops and the fact that there is not a full complement of regular staff technical shift personnel for conditions of inadequate operational reliability of the circuits.

All of this led to unproductive expenditures of work time by operating technical personnel and rapid fatigue on the part of the personnel.

The creation of the ASTO makes it possible to accomplish the following: improve the equipment operating reliability by bringing the operating personnel from the line equipment shop room to the ASTO; reduce circuit downtimes by improving the timeliness of detecting failures by means of detailed automated diagnosis of a fault; objective monitoring support for the quality of work done to correct defects as well as the work load on the technical on-line personnel.

The "Svyaz-1" modular control computer system (MUVK) was used as the host hardware for the ASTO; this system is equipped with two "Elektronika-60" microcomputers having the following peripherals: a GMD 7012 (floppy disk store), a 15 IE-00-013 alphanumeric display and a T-100 telegraph set.

Two PD-66M control panels designed by the Moscow Technical Center for Communications Trunk Management are used for technical personnel service communications; 48 service communications channels are brought out on each of these panels. The circuits from the SVT and SSS bays are brought out on the panel using a two-wire circuit configuration through the network service communications bay (SSSS). The requisite point is called by means of the GTV [voice-frequency ringing generator] in the SSSS; the requisite frequency is selected by setting the numbers on the PD-66M.

The equipment of a line equipment shop is monitored by means of on-off sensors for "Tekh." signaling, installed in each bay. The "Tekh." signals are generated on the PZS circuit boards of the bays. These signals are discriminated (power failure, blown fuse, parameters of amplifier tubes out of tolerance range). These signals cannot be cut off by the "turn off alarm" button.

The status of a line circuit is monitored using the operational signaling "Ekspl." by means of sensors built into the equipment, or using sensors that are installed as an addition (see the table).

For a BPU-4 installation, it is necessary to feed the positive rectified pilot frequency voltage to its input.

The sensors produce the "alarm" and "fault" signals.

A specially designed interface to the system (USO) is used to convert the "Tekh." and "Ekspl." signals to TTL-compatible signals; this interface takes the form of a multiplexer having 128 inputs and 8 outputs. The number of points that are monitored is increased by using several such interfaces.

The signals are transmitted from the interface to the microcomputer, where they are displayed following processing for the technical personnel on the display and the T-100 in the following form: the date, time and duration of a fault; the designation and status of the line circuit being monitored; the designation of the bay, row and point of its installation (in the case of the "Tekh." signal) and the nature of the fault.

When necessary, one can also obtain information at the current point in time concerning the status of one or more line circuits as well as the status of the shop equipment.

In the feeding of the signals to the ASTO, one must be governed by the signal listing approved by the Main Administration for Long Distance Telephone Communications.

An RDM-60 test instrument and switcher that has been developed is used for the determination of a faulty line circuit section (at the circuit's own station or beyond it). The switcher has two switching stages and provides a crosstalk attenuation between input circuits of more than 110 dB. The switching element is an RES-55 hermetically sealed reed relay. The insertion attenuation of the high impedance isolators, which provide for connection to

TABLE

Transmission System	Type of Sensor	Location of the Sensor in the Equipment	Pilot Frequencies of the Line Circuits in Which the Sensors Are Installed, kHz
K-3600	Built-in	STM	768, 9216, 18432
K-1020R	Built-in	STM	288, 4896
VLT-1920	Built-in	V	308, 8544
K-1920U	BPU-4	SPAK	308, 8544
K-300	DKLT	Separate unit	308, 1364
K-60P	BPU-4	SLUK-OP	16, 248
K-24R	Built-in	STM	16, 104

any line circuit, is 40 dB. The switcher is located in the line equipment shop: the first stage is in the line circuit equipment and the second stage is in the SVT bay. The control panel is located in the ASTO. The switcher can be controlled manually (and by a microcomputer in the future).

The first stage in the development of the ASTO, that has made it possible to set up the monitoring of the status of all line circuits and equipment, has been completed. The work being done on the second stage provides for organizing the status monitoring of the network channels (ST) and the automation of measurements for defective network channels.

8225
CSO: 1863/246

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IMPLEMENTATION RESULTS AND PROSPECTS FOR DATABASE ORGANIZATION AND MANAGEMENT SUBSYSTEM OF 'COMMUNICATIONS' AUTOMATED PLAN CALCULATION SYSTEM

Moscow OTECHESTVENNYY OPYT V OTRASLI 'SVYAZ.' SERIYA: EKONOMIKA, PLANIROVANIYA UPRAVLENIYA. EKSPRESS-INFORMATSIYA in Russian No 1-2, 1987 (signed to press 20 Feb 86) pp 1-16

[Booklet by B.V. Yakovlev, USSR Ministry of Communications, "Informsvyaz" Center for Scientific and Technical Information, "Soviet Experience in the 'Communications' Sector; The Series: Economics, Planning and Management. Express Information," 2,750 copies, 16 pages]

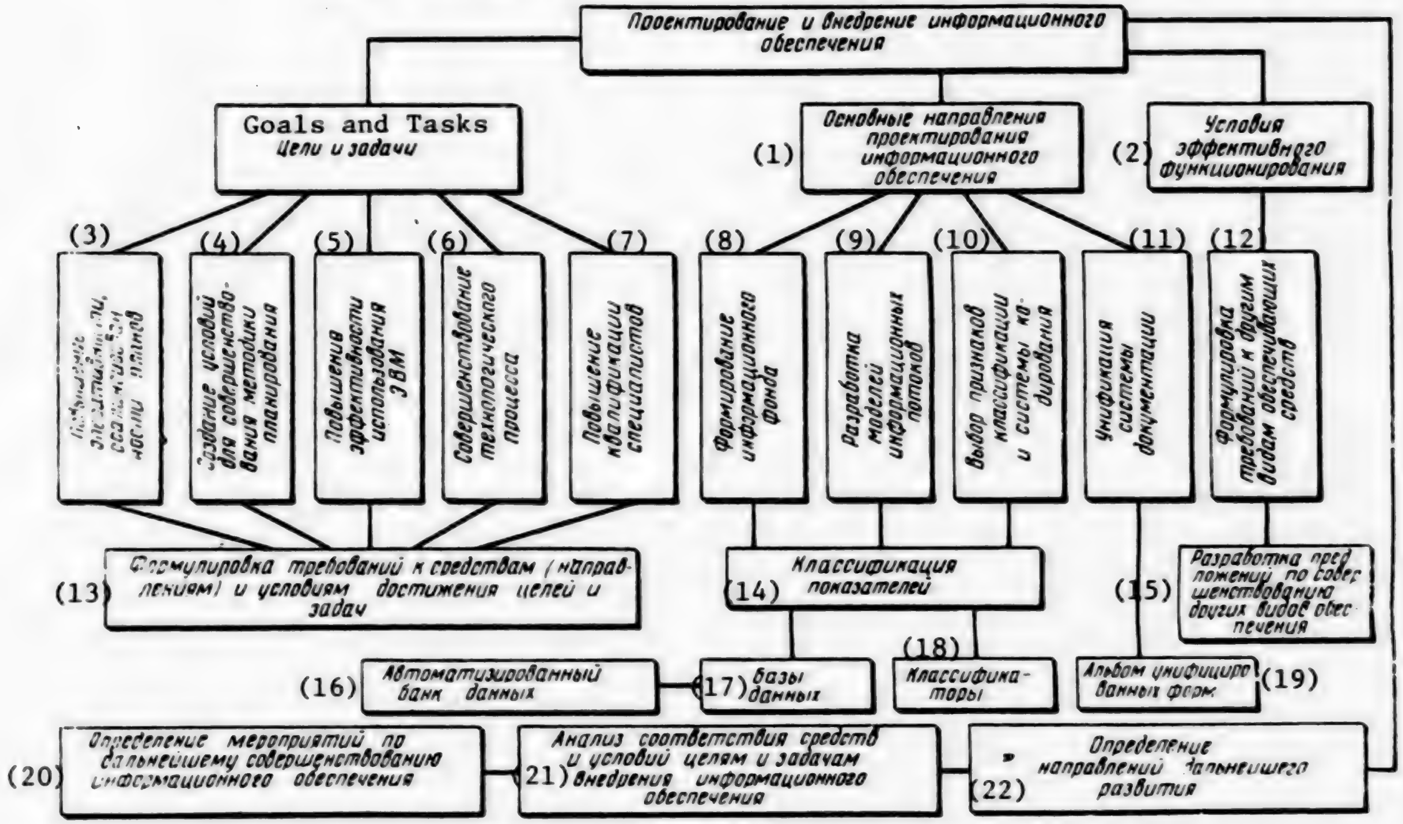
[Text] The database organization and management of the subsystem of the "communications, television and radio broadcasting" automated plan calculation system (ASPR) of the USSR Gosplan is intended for organizing the data needed for planning the development of the "communications" sector as well as for the development of the hardware and techniques that support the formalized representation of the status of the sector, the efficient organization of information flows and files in the subsystem as well as the information compatibility of the subsystem with other functional subsystems of the ASPR of the USSR Gosplan, the "communications" ASPR subsystem of the state planning administrations of the union republics and the OASU [sectoral management automation system] of the USSR Ministry of Communications.

The successful operation of the "communications" ASPR subsystem is determined to a considerable extent by the effectiveness of its database organization and management.

The continual improvement in the methodology and methods for the development of sectoral expansion plans leads to changes in the structure, composition, volumes and applications areas of the data. Information from predictions, estimates of resources, satisfying the national economy and the nation's populace with communications services and systems as well as social and mathematical economics estimates and scientific and technical information on the development of communications systems are becoming increasingly important. Given the conditions of increasing requirements placed on the timeliness of the processing and the reliability of these data, the necessity of planning personnel using computers is becoming an objective requirement.

The figure shows the "tree of goals and functions" for solving the problem of designing and implementing the database organization and management for the sectoral subsystem of the ASPR.

Design and Implementation of Database Organization and Management



Tree of functions and goals for the planning of the database organization and management of the sectoral subsystem of the ASPR [management automation system for planning calculations].

Key:
1. Main directions for the planning of the database organization and management;
2. Conditions for efficient operation;
3. Improving the timeliness and balance of the plans;
4. Creating the conditions for improving planning procedures;
5. Increasing computer utilization effectiveness;
6. Improving the working process;
7. Improving the skill level of specialists;
8. Generating the information fund;
9. Developing the models of the information flows;
10. Selecting the classification attributes and coding system;

[Key to figure on preceding page]:

11. Standardization of the documentation system;
12. Formulation of the requirements placed on other kinds of support systems;
13. Formulation of the requirements placed on the means (approaches to) and conditions for achieving the goals and tasks;
14. Classification of indicators;
15. Development of proposals for improving other kinds of support;
16. Automated data bank;
17. Databases;
18. Classification systems;
19. Catalog of standardized forms;
20. Determination of measures for further improving database organization and management;
21. Analysis of the conformity of the means and conditions to the goals and tasks for the implementation of the database organization and management;
22. Determination of the directions for further development.

The major design goals for database organization and management are as follows:

--Increasing the timeliness, validity and balance of the plans being developed for the development of the "communications" sector by means of providing specialists with complete, reliable and timely data for making the planning decisions;

--Creating the conditions for further improving the procedure for planning the indicators that characterize sector development;

--Improving the efficiency of hardware utilization in the "communications" ASPR subsystem;

--Improving the working process for collecting and processing the data;

--Increasing the skill levels of specialists as regards improving document turnover, validating the group of approved and computed indicators needed for the planning, etc.

The collection and careful preparation of the requisite initial data precede the analytical and computational operations and the making of the planning decisions. The collection of the initial information frequently requires the expenditure of considerable amounts of time. In a number of cases, because of the lack of data, the execution of the entire subsequent chain of work can be held up. In this instance, the specialist is forced to turn to another variant (method) of performing the planning work, which makes it possible to curtail the time needed for its execution. A quite experienced specialist is capable of such a time savings without reducing the quality of the calculations.

The increased complexity of the problems of "communications" sector development requires the active coordination of the ever increasing number of indicators and decisions with other departments of the USSR Gosplan in order to improve the scientific validation and balance of the plans. It is necessary to have complete, reliable and timely information in order to achieve this goal.

The presence of this information also makes it possible to create the conditions for further improving the planning procedures for the indicators that

characterize communications development. It is possible to move on from the simple operations of direct plan calculations to the generation of models that take into account the impact of the most important factors on the processes being studied in the sector as well as the cost effectiveness indicators.

The design and implementation of the database organization and management of the "Svyaz" ASPR [management automation system for planning calculations] subsystem is also directed towards enhancing the utilization efficiency of the computer hardware resources being used by providing for an efficient organization of the data and efficient data processing.

The formulation of the design goals for the database organization and management makes it possible to determine the methods and means for planning each of the elements of the database organization and management structure (see the figure). The database organization and management structure of the subsystem includes:

--The information fund;

--The information flows;

--Systems for classifying and encoding the indicators;

--Formalized data description aids;

-- The standardization of the documentation system.

Because of the limited external memory of the minicomputer model used in the "communications" ASPR subsystem prior to 1985, no informational-procedural basis was created for the system of computer calculations of interlinked indicators. The subsystem information was organized in the form of files and document forms for the calculations. This organization of the data made it difficult to implement new calculations and an unjustified duplication of the information took place.

The main task in this area subsequently was the transition from the execution of local economic planning tasks to the use of overall system tools for the execution of sets of tasks combining the calculations and the creation of the information fund.

The input and output data forms were analyzed so as to determine the set of indicators used in each block of the subsystem and the information flows in order to construct the data fund. A formalized description of the indicators was created and the logic structure of the database was produced in the next step.

Two main components must be discriminated in the planning of the composition of the information fund: a unified list of indicators and files of the numerical values of the indicators.

The sequence for the generation of the information fund of the automated data bank (ABD) must be as follows:

--The selection of the tasks executed in the subsystem;

--The determination of the system of planning and economic indicators used in the execution of the tasks;

--The construction of models of the information flows;

--The classifying and encoding of the indicators;

--The selection of the database management system;

--The determination of the composition of the databases.

The selection of the tasks executed in the "communications" ASPR subsystem was accomplished within the framework of the procedural support planning.

The designations of the indicators are generated from the classification and coding systems for the appropriate category, as well as the forms of the reporting and planning documentation. The analysis of these materials made it possible to determine the following:

--The composition and volumes of the information;

--The sources and users of the information;

--The periodicity and delivery times for the information.

The information flows directed towards the implementation of internal and external data interaction were analyzed in order to check the conformity of the defined composition of the indicators to the requirements of the "communications" ASPR subsystem.

The unified list of indicators of the "communications" ASPR subsystem is used for the unambiguous interpretation of the indicators at all levels of the management automation system for planning calculations, from systematization at the all-union level and for the formalized description of the data in the goals:

--The identification of indicators during data exchange by structural components of the management automation system for planning calculations, when plan personnel access the computer;

--Content standardization of the planning documentation forms in order that the designations and codes of the same indicators agree in all of the forms;

--The linkage of the tasks and blocks in the design of the "communications" ASPR subsystem;

--The design of the logic structures of the databases.

The generation of the list of subsystem indicators completes the first stage in the design of the database organization and management, or the macrodesign [1]. The goals, criteria and information structure of the sectoral subsystem of the ASPR are determination in this stage, as well as its main characteristics. It is specifically here that such major problems as the time for data passage through the subsystem, the interrelationship of its constituent parts and the capability of its adaptation to a changing environment are determined.

The algorithms for the management of the information fund were developed in the second stage of the design of the database organization and management system (microdesign).

Since the plan solutions are detailed to different degrees, it is expedient to represent the schemes for the information flows in the form of schemes of three hierarchical levels:

--Schemes at the level of the "communications" ASPR subsystem as a whole (the overall representation of the internal and external information linkages of the subsystem yield functional-structural schemes);

--Schemes at the level of the subsystem blocks (a mutually linked complete set of tasks);

--Schemes at the level of individual functional tasks.

Schemes at the subsystem level can be employed by managers, while schemes at the level of blocks and tasks can be used by planning personnel.

The information flow schemes at the block level reflect the movement of the main information between the complete sets of block tasks, as well as within each complete set of tasks. The information models of the given level can be designed in various ways, for example, as graphs, spreadsheets, etc. Network models are used in the "communications" ASPR subsystem; these models reflect the logic and time sequence for task execution and the movement of the most important indicators between the tasks.

The first two kinds of information models (schemes) are described quite widely in the literature devoted to questions of ASPR design. For this reason, there is no need to treat them in detail here.

The following array data model (see the table) was developed and experimentally demonstrated for a detailed analysis of information flows at the task level.

A list of the indicators that are used in the given task is located in quadrant I of the matrix model. In this case, the input indicators and the sources they come from are reflected in the subject while the output (calculated) indicators are in the predicate. A filled cell in quadrant I shows that the input indicator whose designation is given in the given row is used for calculating the given output indicator (column).

When filling in the cells, a number is written in that characterizes the ordinal number of the variant for obtaining the output indicator. If one computational variant is used in the task, then one can simply write a "+" sign in the cells.

The row totals for quadrant I characterize the usage frequency of a particular input indicator for calculating the various output indicators.

The column totals for quadrant I show how many input indicators are used for calculations of the given output indicator, taking into account the use of variant calculations.

(A) Источники поступления информации	(B) Выходные входные показатели	I	2	. . .	p	(C) Частота использования входного показателя (итого)	(D) Адресаты выходных показателей (отделы Госплана СССР, задачи подсистемы АСПР "Связь") I	2	. . .	m	Итого TOTAL
	I.										
	2.										
	3.										
	4.										
	.										
	.		I						П		
	.										
	n										
Total	Итого										

Key: A. Sources of incoming data;
B. Output, input indicators;
C. Usage frequency of an input indicator (total);
D. Addresses of the output indicators (divisions of the USSR Gosplan, tasks of the "communications" ASPR subsystem).

Quadrant II reflects the information linkage to divisions of the USSR Gosplan, i.e. the transmission of the indicators to the users of this information, as well as the utilization of the output indicators for executing other tasks of the "communications" ASPR subsystem.

The column totals for quadrant II show how many of the calculated indicators are sent to a particular USSR Gosplan division (or to another functional subsystem of the ASPR).

The row totals reflect the utilization of the indicator in other subsystems of the ASPR.

The proposed information model enables the following:

--Detailed analysis of the interrelationship of the input and output indicators;

--Having clear information on the sources of the information, the presence of multivariant calculations and the degree of utilization of each input indicator in the plan calculations;

--Tracing the subsequent use of the output indicators;

--The determination of the total number of output indicators of the subsystem, that are fed to each USSR Gosplan division and the appropriate task.

If a unified listing of the technical and economic indicators of the "communications" ASPR subsystem is located in the subject and predicate of quadrant I, then a detailed information model of the entire subsystem as a whole will be obtained, though admittedly, it loses clarity and will be quite cumbersome in this case.

The classification of the indicators was accomplished as follows in the next stage of the database organization and management design effort:

a) Based on the content attributes (with respect to the represented processes, forms and reproduction elements;

b) Based on the organizational structural reproduction elements (subsectoral, territorial);

c) Based on the functional role and assignment of the indicators (reporting, planning, analytical, in accordance with sections of a plan);

d) Based on the techniques and methods for calculating the indicators (absolute, relative, primary, derivative);

e) Based on the time characteristics.

The requirements placed on the information fund of the automated data bank (ABD) [2] were taken into account in order to make the selection of the types of interrelationships enumerated above between the indicators, which must be considered when planning the database organization and management for the subsystem:

--Multifunction performance and completeness of the representation of all aspects of the functioning of the sectoral subsystem of the ASPR, with these features reflected in the state plans;

--Independence of the ABD information fund from special cases of data applications and the computation of algorithms (i.e. independence from variants and planning task execution processes);

—The absence of data duplication (only base indicators are to be stored in the ABD; one can obtain all of the data used in the performance of the calculations on the basis of these indicators);

--Convenience of operation and access (interactive operation, simplicity in accessing the computer);

--Structural flexibility that provides for an expansion capability without substantially restructuring the ABD information fund.

The overall structure of the list of indicators of the "communications" ASPR subsystem includes rubrics, subrubrics and indicators. Five rubrics were initially defined in the list. The topically close groups of indicators oriented towards complete sets of tasks are concentrated in the subrubrics.

The structure of the list of indicators at the level of rubrics and subrubrics is given below.

1. Main Economic Indicators

1.1. Structure (subsectoral) of the communications product
1.2. Outgoing exchange
1.3. Structure of the income from the main activity
1.4. Income from the populace
1.5. Movement of fixed production capital
1.6. Structure of the operational expenditures

2. Labor and Personnel

2.1. Population and number of families
2.2. Number of personnel and wage fund for personnel engaged in the main activity, FMP

3. Capital Investments

3.1. Technological structure of the capital investments
3.2. Reproduction structure of the capital investments
3.3. Structure (subsectoral) of the capital investments
3.4. Bringing production capacities on line

4. On-Line Reporting Data

4.1. Production volume
4.2. Income from the primary activity
4.3. Outgoing exchange

5. Developmental Indicators for Communications Systems

5.1. Long distance telephone service
5.2. Telegraph service
5.3. Municipal telephone service
5.4. Rural telephone service
5.5. Radio communications, radio broadcasting, television, space communications
5.6. Postal service

As a result, all of the indicators of the information fund were grouped into five groups. Each of these groups has the capability of storing the numerical values of the indicators for a long period of time and incorporates 17 funds (the "communications" sector, the USSR Ministry of Communications and the communications ministries of the union republics). Thus, the numerical data are located in 85 funds (17 x 5).

The indicators of the All-Union Classification System for Technical and Economic Information (OK TEI) were used for the description and encoding of the indicators of the "communications" ASPR subsystem; while local classification systems were developed for attributes not covered by the all-union classification systems.

An efficient organization can be established for the calculations by satisfying the requirements for integrated data processing. The tools for achieving this goal are database management systems (DBMS).

A DBMS is a comprehensive system incorporating special structures for data organization (databases), specialized languages and utility software that as an aggregate support the creation and operation of effective aids for the retrieval of information, updating it, correcting it and its multipurpose utilization by various users [3].

The main principle underlying integrated data storage is the structuring of the data.

The DISOTA system was selected as the DBMS in the "communications" ASPR subsystem [4]. This system is designed for generating and maintaining databases using the "Iskra-226" minicomputer and developing various spreadsheets using these databases.

Databases are produced, as a rule, for particular applications: for a definite group of indicators, standards, definite facilities, geographical area, etc. It is practically impossible to construct a database for all subsystem tasks simultaneously.

The result of all of the efforts considered above was the creation of the conditions for producing the automated data bank of the "communications" ASPR subsystem.

An automated data bank (ABD) is defined as an aggregate of data of a complex structure having a large volume that is organized in a special manner, as well as the aids (information, hardware and organizational) that support the accumulation, storage, updating and retrieval of the data [5].

The presence of the ASPR sectoral subsystem automated data bank makes it possible to: facilitate and accelerate the updating of the information fund, accelerate the development of applied programs, efficiently utilize external computer data stores and perform different variants of the calculations during the development of draft plans for the expansion of the "communications" sector.

In order to organize the accessing to the data funds, a three-digit code is used for it; this code has the structure: NF, where N is the code of the object, which takes on values of from 1 to 17, while F is the number of the group of indicators, which takes on values of from 1 to 5.

The numerical data funds are located on a plug-in magnetic disk, while the text funds (the designations of the indicators and the measurement units) are located on a hard minicomputer disk.

An important developmental area for database organization and management is the standardization of the documentation system.

According [6], the standardized system of plan documentation takes the form of the means for executing the information processes of documented data exchange established by the state standards and the organizational procedure for national economic planning for the case of ASPR implementation and operation.

The goal of the development and implementation of the standardized system of plan documentation in the "communications" ASPR sectoral subsystem is the creation of a system of documents that most completely satisfy the requirements for their computer processing, and contain the requisite data for the development of plans at the sectoral and territorial levels with minimal expenditures for data collection, processing and transmission.

The basis for the standardized system of plan documentation of the "communications" ASPR subsystem is the documentation developed and approved by the USSR Gosplan, in accordance with which the drafts of plans and the calculations for them are prepared and presented by the USSR Ministry of Communications and the councils of ministers of the union republics to the USSR Gosplan, and these drafts and calculations are subsequently used in drawing up the state plans for the development of the "communications" sector.

An album of standardized document forms for the tasks of the first and second stages of the implementation of the "communications" ASPR subsystem has been created as a result of the plan development efforts and a listing of internal forms has been drawn up.

When the subsystem designers coordinated the effort with specialists for the input and output documentation forms for each task, the requirements placed on the standardized system of plan documentation were taken into account:

--The requisite information content for the execution of the planning calculations based on the set of models, algorithms and decision making methods incorporated in the subsystem;

--The linkage to the specific features of the methodology and the generation of the system of indicators used in the planning of the sector;

--Clarity and convenience for the specialists and the determination of the responsibility of specific executive personnel for the documentation of the planning information;

--Minimization and standardization of the prototypes of the standardized forms;

--The minimization of the documented information flows through the achievement of an efficient information interaction and information linkage of the tasks being executed as well as the development of the information fund of the subsystem.

The problem of designing the database organization and management system for the "communications" ASPR sectoral subsystem is a complex problem and can be successfully solved only with a clear-cut organization of the design effort for it in conjunction with the use of other support aids.

First of all, the database organization and management place considerable requirements on the procedural support, since the procedures for communications planning and the models employed for the plan calculations also determine the system of economic planning indicators that are used. The most important requirement of the database organization and management for the

procedural support follows from this: the refinement of the structural and functional schemes for the development of the plans for the expansion of the "communications" sector and the methods of executing economic planning tasks.

During the development of the operational technology, it was necessary to comprehensively resolve the questions of the process of data collection, processing, storage, retrieval and transmission. All of these design solutions must comprise the fund of instructions concerning the forms and the procedure for the presentation of the information, as well as the schemes for the operational processes of data processing.

An important task of database organization and management is the structuring of the data. For this reason, the more defined the structure of the ASPR sectoral subsystem itself is, the more clearly and efficiently the data flows and volumes can be distributed among the facilities processing these data. However, the clarity of the "communications" ASPR subsystem structure depends in many regards on the correctness of the distribution of specific functions and tasks among specialists who are called upon the handle the primary data flows, i.e. this clarity depends on the efforts involved in designing the organizational and structural support and management for the process of developing the sector development plan.

The implementation of the automated data bank of the "communications" ASPR subsystem also places requirements on the software: the development of tools for the convenient management of the information fund and computational programs using the DISOTA system, including tasks of a data retrieval and reference nature.

The increasing volume of data to be processed during ABD operation necessitates the installation of duplication facilities. This requirement applies to the subsystem hardware.

The automated data bank organization also necessitates an improvement in the skill levels of specialists in the field of the classification and encoding of the indicators, the standardization of documents, the organization of the ABD and know-how in the interactive use of it (personnel support).

An analysis of the problems considered here related to the design of the database organization and management for the "communications" ASPR subsystem has made it possible to draw the following conclusions and determine the major directions for the further development of the subsystem:

1. The methods and means being implemented for the database organization and management are directed towards the consistent attainment of the formulated goals and tasks.

Specialists obtain extensive information for the analysis of the original and calculated indicators when executing the majority of implemented tasks. This makes it possible to improve the substantiation for the planning decisions being made.

The systematizing of the subsystem indicators has made it possible to formulate and set up a number of new tasks and procedures for calculating indicators, for example, the tasks of: "Index Factor Analysis of the Major Economic Indicators for the Communications Subsectors and Communications Ministries of the Union Republics", "Monitoring the Fulfillment of the Plan for the Major Indicators of the Communications Sector", "Determination of the Bringing of Municipal Automated Telephone Exchanges on Line", etc.

The implementation of the automated data base has enabled an improvement in the utilization effectiveness of minicomputers. First of all, avoiding the duplication of the storage of the indicators has brought about more efficient utilization of the external memory; secondly, minicomputer time spent on initial data input procedures has been reduced and the time used for computational operations has increased correspondingly; thirdly, the average daily load on the computers has increased, including the load due to data retrieval tasks.

Putting the information fund of the "communications" ASPR subsystem in order promotes an improvement in the planning calculation technology through the establishing of regulations for the process of collecting, inputting and monitoring the indicators in the ABD as well as curtailing the time for coordinating the output indicators, because of the large volume of additionally calculated analytical indicators.

2. A system analysis of the problems of the design and implementation of the database organization and management has made it possible to develop a "tree of goals and functions", which reflects the major goals, areas (means) of implementation of the database organization and management as well as the conditions for its efficient functioning.

A unified list of indicators has been drawn up, which was the result of analyzing the constructed information flow schemes at three levels: task; block and "communications" ASPR subsystem.

A matrix information model that makes it possible to reflect the interrelationship of the input and output indicators, all computational variants for the indicators, the subsequent use of the output indicators, etc. has been proposed for the analysis of the information flows at the task level.

A classification system has been established for a unified list of indicators, taking into account the requirements placed on the ABD information fund. As a result, the list of indicators was grouped into 5 groups, or 85 funds with the capability of adding onto them later.

The DISOTA system was selected as the database management system. An automated data bank for the subsystem was implemented as a result of the planning work that has been done.

An album of standardized and internal forms has been drawn up for the purposes of standardizing the documents.

The primary requirements placed on the other kinds of support systems were worked out when investigating the conditions for the efficient functioning of the database organization and management of the subsystem.

3. The following are proposed for the further development and improvement of the database organization and management:

a) Supplement the information fund of the "communications" ASPR subsystem with data that reflect the following: the territorial cross-section of the plan for the development of the "Communications" sector; a system of norms and standards; the characteristics of particular communications facilities (for example, the most important construction projects in the sector), etc.;

b) Prepare proposals for supplementing the all-union classification systems and products lists with local terms and concepts. Organize the minicomputer management of the systemwide dictionaries used in the subsystem;

c) Develop instructions that govern the content of the database in the updated state, including the periodicity and procedure for copying it and monitoring the reliability of the data;

d) Improve the models of the data flows at the level of blocks and task sets, taking into account the implementation of new tasks;

e) More precisely define the requirements placed on the content of the hardware assignments for task programming (task formulations), taking into account the utilization of the DISOTA system;

f) Coordinate the procedure and timeframes for the delivery of additional data to the "communications" ASPR subsystem with the USSR Ministry of Communications, in connection with the implementation of new tasks and new methods of calculating the indicators.

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8225
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UDC 383/384

APPLICATION OF SPEKTR DATABASE MANAGEMENT SYSTEM TO ACCOUNTING TASKS

Moscow OTECHESTVENNYY OPYT V OTRASLI 'SVYAZ.' SERIYA: EKONOMIKA, PLANIROVANIYA UPRAVLENIYA. EKSPRESS-INFORMATSIYA in Russian No 3-4, 1987 (manuscript received 7 Jan 86) pp 1-6

[Article by I.A. Rumyantseva]

[Text] The majority of accounting tasks such as accounting for fixed capital, accounting for raw materials and goods, accounting for low-valued and rapidly wearing objects, labor and wage accounting, accounting for income from the operation of communications facilities, etc. requires high reliability of the results and substantial labor input requirements. With the increase in the volumes of processed data, the number of routine operations increases and it become necessary to automate them. Because of this, the decision was made in the MTTsUMS [Moscow Technical Center for Communications Trunk Management] to automate such accounting tasks as accounting for fixed capital, accounting for materials, accounting for low-valued and rapidly wearing objects as well as summary accounting and the compiling of reports.

The VGPTI TsSU SSSR [All-Union State Planning and Process Engineering Institute of the USSR Central Statistical Administration] has developed a complete set of standard design solutions conforming to the sections of the "Accounting" subsystem (TPR-2), the applied programs of which provide for data exchange with the database by means of the PARMA database management system [DBMS].

The TPR-2 complete set of standard plan solutions is oriented towards enterprises of the machine-building sectors; nonetheless, the formulation of certain tasks such as accounting for fixed capital is in many respects applicable to the MTTsUMS, and for this reason, the TPR-2 was taken as the basis of the formulation of the fixed capital accounting task.

The following requirements were placed on the selection of the tools for task execution:

--The size of the external memory used for the information, because of the small computer system configuration, must not exceed two magnetic disks with a capacity of 29 Mbytes;

--The software complexes intended for the computer-aided solution of the accounting tasks must be interrelated in terms of information (for example, for executing the task of summary accounting and report compiling, it is necessary to have the results of the execution of the tasks of fixed capital accounting, accounting for materials, labor and wage accounting, etc.);

--The data stored in the computer must be oriented not towards individual programs, but rather towards the requirements of an entire enterprise (the same data can be used by various subdivisions of an enterprise, for example, the bookkeeping and planning-financial department). The requirements may change, for example, it may become necessary to make timely changes in the existing output forms or to issue new forms.

In addition to these requirements, it is desirable to reduce the software development and debugging timeframes where possible.

The third of the requirements enumerated here leads to the conclusion that in order to execute these tasks, it is more convenient to employ a database management system than programs that utilize individual files.

The following objects, for which the databases are set up, are typical of the accounting tasks for an enterprise:

--Inventory objects;

--Materials;

--Goods;

--Bookkeeping;

--Enterprise personnel.

The applied programs of these databases form the program complexes that are constructed in conformity with the applied principle and for this reason correspond to the accounting tasks and not the objects of this accounting:

--Accounting for fixed capital;

--Accounting for physical assets;

--Accounting for wages and labor;

--Production expenditure accounting;

--Income accounting;

--Accounting for financial and calculation operations;

--Summary accounting and the compilation of reports.

The interrelationship of the program complexes with the object databases can be traced using the example of the tasks of accounting for fixed capital, accounting for physical assets, summary accounting and the compilation of reports (see the table).

TABLE

Program Complexes	Functional Tasks	Subject Databases Used by the Program Complexes
Fixed capital accounting	Object-by-object accounting for fixed capital in accordance with the operation and storage sites; Accounting for the presence and motion of fixed capital by groups and kinds; Amortization fund and wear accounting; Fixed capital accounting for calculating payments to the budget.	Inventory accounting objects
Accounting for physical assets	Calculating the cost estimate of accounting operations in firm accounting prices; Accounting for physical assets with respect to storage and operation sites; Accounting for the acquisition of physical assets; Accounting for low-valued and rapidly wearing objects in operation; Revaluation accounting; Cost accounting for physical assets by groups and kinds; Summary accounting for physical assets.	Materials
Summary accounting and the compiling of reports	Generation of data for auditing the accounts; Generation of data for the reporting forms	Objects of inventory accounting, materials and other subject databases

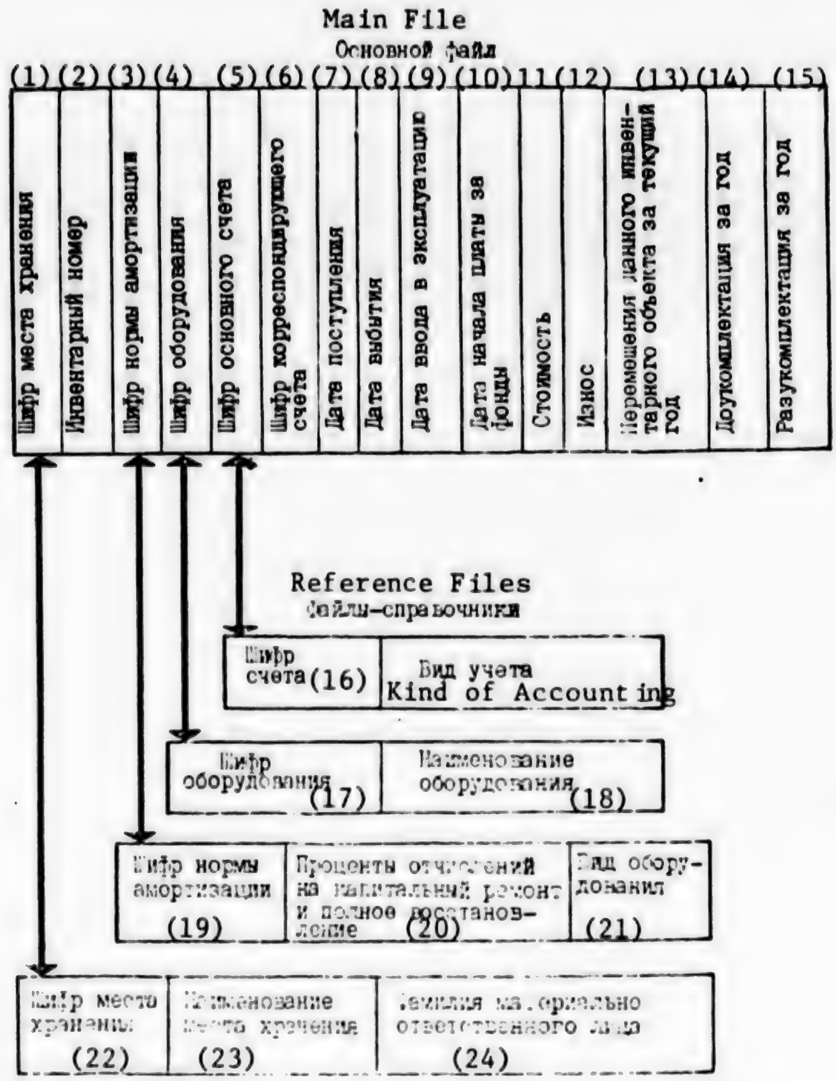
In order to provide the basis for processing informal queries and changing applications and queries, the data models in the design of the databases were constructed using the real linkages between the data elements, and not using the linkages employed in the applications.

The result of the conceptual design was the normalized model 1.

The data representation model for the fixed capital accounting task is shown in the figure.

The question of the particular DBMS for the execution of the complete set of enterprise accounting tasks was treated subsequently. An analysis of the requirements placed on the development effort, which were enumerated above, and a comparison of the capabilities of the various database management systems led to the SPEKTR database management system being selected for the execution of the tasks.

In fact, the presence of utilities in the SPEKTR DBMS makes it possible to significantly curtail the volume of work involved in the adaptation of the DBMS. The query language makes it possible to reduce the expenditures for



Information representation model for the fixed capital accounting task.

Key:
1. Code for the storage site;
2. Inventory number;
3. Code for the amortization norm;
4. Equipment code;
5. Main account code;
6. Code for the corresponding account;
7. Date of arrival;
8. Date of departure;
9. Date placed in service;
10. Date of starting payment for funds;
11. Cost;
12. Wear;
13. Movements of the given inventory object over the current year;
14. Staff added during the year;
15. Staff removed during the year;
16. Account code;
17. Equipment code;
18. Designation of the equipment;
19. Code for the amortization norm;
20. Deduction percentages for capital repairs and complete restoration;
21. Kind of equipment;
22. Code for storage site;
23. Designation of storage site;
24. Name of physically responsible person.

writing and debugging the programs, in particular, for the fixed capital accounting tasks only one program in all was needed for the generation of the output form, written in the algorithmic PL/1 language, since the size of the query implementing this function exceeded the permissible amount. All the other process tasks related to the generation of the output document forms were handled by means of the query language. Thus, the requirement for reduced program debugging times is met.

Double data compression - as the suppression of the leading zeros in the digital data and the concluding spaces in the character field as well as the suppression of the zero (space) fields - makes it possible to economize on the external memory (the first requirement imposed on the selection of the tools for the execution of a task).

Moreover, the rapid retrieval of data (the search time rises more slowly than the size of the database increases) makes it possible even during debugging to correctly estimate the time expenditures for the various process steps.

The properties indicated here are responsible for the preferential choice of the SPEKTR DBMS over, for example, the OKA DBMS in this subject area, since the OKA DBMS does not provide for inverted search and reliable emulation of network structures.

During the development, the primary documents were taken from an album of standard forms approved by the USSR Central Statistical Administration. The output forms correspond to one of the variants proposed in the TPR-2. The program sets are interrelated by a unified classification and coding system, a unified database management system (the SPEKTR DBMS) as well as by information files that are transmitted from one program set to the other (for example, all of the sets transmit information for the tasks of financial and calculations operations accounting, summary accounting and compiling reports).

At the present time, the task of fixed capital accounting has been placed in trial operation at one of the facilities of the MTTsUMS. The results of the developmental effort and the considerably reduced timeframes within which it was accomplished make it possible to assert the promise of using the SPEKTR DBMS for the execution of other accounting tasks.

The calculation of cost effectiveness using the procedure adopted in the communications sector has been carried out for the fixed capital accounting task and is, in accordance with the preliminary estimate, 5,000 rubles annually.

In order to estimate the savings in the development of the DBMS itself as compared to the use of the standard SPEKTR, a procedure was used that was proposed by the "Moskva" Management Automation System Scientific Production Association, which consists in the following: the savings from the use of the SPEKTR DBMS in a particular enterprise is defined as the difference between the cost of software development and its adaptation to database management software.

This definition of the savings obtained by the user organization through the use of the SPEKTR DBMS is based on the reduction in the expenditures for writing the algorithms, programming, debugging, the consumption of materials, etc. during the design of the program product itself.

The costs for the development of the SPEKTR DBMS, according to the data of the "Moskva" Management Automation System Scientific Production Association were 212,000 rubles. The relative labor input requirement for the development of the various components of the SPEKTR DBMS is estimated as follows:

--The core of the SPEKTR DBMS and the utilities: 50%;

--The SPINTER interactive query language: 30%;

--The SPMAKRO macrointerface to high level languages: 10%;

--The SPG group servicing mode: 10%.

The adaptation costs of the SPEKTR DBMS comprise 5 to 10% of the developmental costs.

Calculations performed using this procedure show a cost savings for DBMS development amounting to 170,000 rubles.

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NEW METHODS FOR LOGIC MONITORING OF DATA ON LONG DISTANCE AND INTERNATIONAL TELEPHONE SERVICE IN AUTOMATED SUBSYSTEM FOR REAL-TIME DATA RETRIEVAL AND PROCESSING OF MOSCOW TERRITORIAL CENTER FOR MANAGEMENT OF LONG DISTANCE AND INTERNATIONAL COMMUNICATIONS

Moscow OTECHESTVENNYY OPYT V OTRASLI 'SVYAZ.' SERIYA: EKONOMIKA, PLANIROVANIYA UPRAVLENIYA. EKSPRESS-INFORMATSIYA in Russian No 3-4, 1987 (signed to press 7 Jan 86) pp 12-15

[Article by S.M. Babich]

[Text] Data incoming from the various long distance telephone exchanges in the Moscow Territorial Center for Long Distance and International Communications Management to the subsystem for real-time data retrieval and processing are subjected to logic and format checking. The subsystem was developed jointly by the Central Scientific Research Institute for Communications, Moscow Oblast Scientific Research Institute for Communications and the Moscow Territorial Center for Long Distance and International Communications Management and initially contained individual sets of programs for data input, logic and format testing as well as data standardization for each facility in the Moscow Territorial Center for Long Distance and International Communications Management.

Each of these program sets was oriented towards a definite code, format and type of hardware medium. The following configuration was the most optimal for the subsystem input: the capability of step-by-step introduction was assured, the procedures for making changes in the software were simplified, designer supervision was facilitated and the independence of the individual input sections provided a rather high subsystem reliability during the trial operation period.

In step with the development and improvement of the subsystem for real-time data processing and acquisition (PSO), it became necessary to change the approach itself to the organization of the logic and format monitoring, something that was due to the following factors:

--The inclusion in the real-time data retrieval and processing subsystem of hardware and software for data teleprocessing (TOD);

--The appearance of new requirements placed on the segregation of the information according to the information types;

--The increased requirements placed on the quality of the process data.

The use of separate input sections and the localization of the logic monitoring at the data input ceased to be optimal. A decision was made to create a single unit for the reception and monitoring of the data from the teleprocessing control system (SUTO): the SPRUT, with automatic adjustment for the message code and format as well as the inclusion of additional logic monitoring during the data processing.

The data receiving and monitoring unit includes two main modules: the module for communications with the SUTO and the module for data input and logic monitoring.

The communications module supports data reception from the SUTO queues and writes them into the connected set of initial data. The correctness of the formatting of the messages (texts) and the protection against repeated input and the identification of the information source are accomplished during this. The module is supplemented with programs for data recovery from the SUTO queues in emergency situations.

The input and monitoring module provides for the following:

--Data reception from the connected set or from the archive, as well as from the hardware media;

--Adaptation of the monitoring programs to the requisite message code and format based on the information source identifier;

--Format monitoring of a message;

--Logic monitoring of all message requisites for permissible range of variation;

--Setting the tariffs for long distance (MTR) and international (MNTR) telephone calls;

--Presenting the data in a standardized format for subsequent processing;

--Including additional attributes necessary for the segregation of the data according to the kinds of information into the standardized format.

Since the information obtained in the real-time data retrieval and processing subsystem is used when determining the operational indicators of the facilities (long-distance telephone exchanges) and in calculations with subscribers, the requirements placed on its reliability and quality are extremely high.

The following are subjected to logic testing:

--The telephone number of subscriber A is checked for missing digits and conformity to the Moscow telephone book;

--The telephone number of subscriber A is checked for missing digits;

--The length of a call is checked for the ultimate permissible value.

The permissible value is different for different long distance telephone offices, ranging from 30 to 120 minutes. A long distance call lasting longer than the threshold value, the data for which are fed into the subsystem for the first time (not a correction), is not forwarded for processing, but rather fed out in an input protocol for ascertaining the actual duration of the call. This type of monitoring is new and makes it possible to separately process long-duration long distance calls, precluding the presentation of invalid bills.

The starting (or ending) time of a call is checked for the maximum value of 0 + 23 hr. This type of checking also existed earlier. Moreover, the conversation time is compared with the time of data arrival for processing. In case the check deadline for the delivery of data in the standardized format is violated, the appropriate attribute is inserted. This type of checking is introduced here for the first time. It makes it possible to monitor the long distance telephone exchange fulfillment of the schedule for information transmission and reception as well as automatically analyze the reasons for delays in the transmission of information to hotels.

The date of a call is checked. The first incoming information having a call date that differs from the current date by no more than one day is forwarded for further processing. The date of data that has come in repeatedly (a correction) is checked for conformity to the calendar. This type of checking is new and prevents the input of data with a distorted data for processing.

The route code is checked. It is checked for conformity with the reference books for route codes (international and within the USSR).

The automatic telephone exchange number is checked for "substitution". This type of checking is also new and makes it possible to check the correctness of the entry of the automatic telephone exchange number in a message for long distance calls made through a type ARM-20 automatic long distance telephone exchange. The checking is accomplished using a special file. Data with an incorrect automatic telephone exchange number are printed out in the input protocol and a separate graph indicates the proposed undistorted number. The introduction of this type of checking has made it possible to eliminate the incorrect addressing of bills in the case when the automatic telephone exchange number of the calling subscriber is distorted.

Format checking is accomplished using separator attributes for the set format length.

Messages without a set format, identifiers and flaws in the requisites ascertained as a result of the checking are printed in the input protocol separately for the facilities of the Moscow Territorial Center for Communications Trunk Management for restoration and repeated forwarding for processing.

It proved to be expedient to locate a number of the logic checking programs outside the common module.

Automated checking of the correctness of the assignment of categories is accomplished during the on-line data processing. This type of checking is

new and allows the determination of the numbers of telephones with an incorrectly assigned or distorted category, which is especially important when processing data on hotel long-distance calls as well as data on the operation of long-distance coin-operated telephones.

The checking is accomplished using the data for the last week of each month. The numbers of telephones with an incorrectly assigned (or distorted) category are printed out for each automatic telephone exchange and are sent to the Moscow Municipal Telephone Network to take the appropriate steps. This type of checking makes it possible in the final analysis to increase the data processing speed for hotel long-distance telephone calls.

The association of a telephone number with a public telephone call station is also checked. During the trial operation of the real-time data retrieval and processing subsystem, it was found that long distance telephone calls are made with direct dialing from certain public call stations (from telephone booths). The information on such long-distance calls is printed out in a separate reference.

And the last kind of logic checking incorporated in the real-time data retrieval and processing subsystem in 1985 checks the data for the possibility of a substitution error in the subscriber A number. A special card file is used that includes the most frequently distorted telephone numbers in order to select and separately process the data on long-distance calls that have taken place from these telephone numbers.

The new organization for information monitoring in the real-time data retrieval and processing subsystem, as well as the inclusion of new types of checks have made it possible to improve the quality of the output information and substantially reduce the number of claims by subscribers because of disagreements with the presented bills.

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BRIEFS

THE COMPUTER HELPS OUT--A computer has come to the aid of the specialists of the "Krasny Proletariy" Machine Tool Building Plant imeni Yefremov, who have been working on problems of improving the reliability and quality of robotics technology. An entire automated computer system was created which makes testing possible of many parameters of robots as early as their assembly stage. Researchers at the Institute of Machine Science of the USSR Academy of Sciences imeni A. A. Blagonravov are helping the manufacturing personnel in this difficult task. By combining the efforts of researchers and machine tool builders, they are not only solving complex problems of development and startup of the system, but they are also garnering the experience necessary for its wide-scale application to the machine building industry. I am referring here to quality control of the robots to be assembled, and also to keeping track of the status of their component parts while they are in service. Specialists from the Laboratory for Problems of Reliability of Robot Technology Systems, staff members from the Institute of Machine Science and specialists from "Krasnyy Proletariy" are working side by side, solving a number of other problems connected with the improvement of industrial manipulators already produced by the Plant, having mastered new, improved and more glitch-free technology. With the combined efforts of the researchers and production personnel, preliminary work is under way to prepare first for experimental, and then for commercial production of robots which will differ from current models by a number of fundamental distinctions. [By N. Taran] [Text] [Moscow MOSKOVSKAYA PRAVDA in Russian 10 Oct 86 p 1] 13289/5915

TRAINING ON PERSONAL COMPUTERS IN THE UKRAINE

Kiev RABOCHAYA GAZETA in Russian 10 Apr 87 p 2

[Article, unsigned, entitled "Personal Computers" under the rubric "The Working Power of Science"]

[Text] The Zaporozhian Oblast. A course in speeding up the social and economic development and reorganization of the economy is impossible to implement without using computer hardware.

The first personal computers were produced in 1976, and now there are more than 20,000,000 in the world. Creating programs for personal computers is the basic task of the Berdyanskiy affiliate of the AN SSSR's Institute for questions in informatics.

Specialists of the affiliate are carrying on work in creating programs for automating the working place: "Text and processing" for relieving the work of journalists and periodical editors; "Institution" for quicker preparation of various documentation, planned economic estimates, and accounting operations; and "Medicinal worker."

The first series of tasks in creating the "Medicinal worker" programs for the automated working place have been finished, and in the Berdyanskiy health resort poly-clinic "Zhemchug" (Pearl), 1400 patients have already been served by doctors using personal computers. This was done by the efforts of the medical workers themselves, without the help of any special maintenance personnel.

Not long ago, the technical and economic council of the Berdyansk gorkom (city committee) of the Ukraine Communist Party created a center for teaching specialists, and representatives of plants and city organizations, the foundations of informatics, at the facilities of the affiliate of the Institute for problems in informatics. Over 500 people have already passed the course of instruction. The center fulfills another important task: it promotes the awakening of creative initiative of the specialists adapting contemporary means of information processing. And in that consists the main thing that the conditions of reorganization require of us.

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A CLASS AT THE COMPUTER TERMINAL... IN A RAILROAD CAR

Tbilisi MOLODEZH GRUZII in Russian 27 Sep 86 p 5

[Article by Special Correspondent G. Giorgadze, from Sagaredzho, Gurdzhaani, and Tsiteli Tskaro, under the rubric "'Young Communist of Georgia': Pathways of School Reform"]

[Text] On the great clock of the Borzhoma station--four in the afternoon. Flocks of school children in snow-white shirts and pinafores fill nearly the entire station platform; from all sides are heard joking, merry voices, laughter. The hands of the clock run along with remorseless swiftness, and the time designated on the schedule for the departure on a routine trip of the propaganda train "Young Communist of Georgia" has already passed long ago, but its red and sky-blue form is still here in Tbilisi. Indeed, the reason is a fairly convincing one; our colleagues from the television station are filming a sequence for the program "Time." But now comes the final scene--"Young Communist of Georgia" is setting out on its way.

Once under way, to the measured clatter of the wheels, the participants in the trip came together in a meeting to discuss once more the plans for the work at the field sites. And they proposed to do quite a bit. Each one had his or her own set of problems, which was why it was so noisy in the car. Scientific Associate of the Republic House of Public Health Education Mamuka Chkheidze, Deputy Chairman of the Auditing Commission of the Republic Voluntary Society for the Struggle for Sobriety Teymuraz Tatarashvili, Attorney Giya Peradze, Head of the Section of Traveling Exhibits of the Tbilisi House of Artists Teymuraz Yakobashvili, Scientific Associate of the Republic Narcological Center Mikhail Afanas'yev and the members of the folk trio "Saundzhe," all were interrupting each other, all were laying out their proposals to each other. Only the main "heroes" of today's trip were at ease; they already knew what actually would happen.

"This trip was timed for the beginning of the new school year," says Avtandil Nodiya, the deputy head of the train. "It was exactly this that determined the aim of this propaganda trip. At the initiative of the Central Committee of the Leninist Young Communist League of Georgia and the Tbilisi Affiliate of the Moscow Science Center of the Specialized Science and Production Combine "Algoritm" it was decided to organize a single-theme trip on a propaganda train to familiarize the students at the middle schools of the Kakhetinskaya Zone with the principles and fundamentals of working with computer systems.

To do this we were equipped with a special classroom, to which one railroad car was dedicated entirely. Here the children will be able to hear lectures by experts and carry out practical assignments. Such trips to various regions of the Republic will become a regular thing."

One would have to agree that "Young Communist of Georgia" had been soundly prepared. This was the first trip after repairs. All four cars had undergone a prophylaxis; both the rolling parts and the interiors had been made new again. The showroom for the traveling exhibit had been made over from scratch; this time there would be presented here an exposition of the works of the young artist Akakiy Ramishvili.

Right now, while "Young Communist" is in for maintenance and the members of the propaganda brigade have returned to their work, it can be said with confidence--Avtandil turned out to be right. Undoubtedly this trip will be long remembered by the inhabitants of the Sagaredzho, Gurdzhaani, and Tsiteli Tskaro regions. And most of all, the meetings which the passengers of the red-and-blue train have organized.

"The computer is, perhaps, the most obedient, the best informed, the most indefatigable helper a person can have. Of course, you've heard it before--a computer is able to do much of what a human can do. For example, it can write poetry, compose music, play chess. It can calculate with "mind-bending" speed, in this field at least far surpassing humans..."

That, approximately, was how Leading Specialist of the Tbilisi Affiliate of the Specialized Science and Production Combine "Algoritm" Roin Mirianashvili would begin his lectures to his boisterous audiences. And the boys and girls, who would instantly quiet down, would soon be listening to him with unconcealable interest.

"But how do you explain to the machine what it's supposed to do?" Sensing the general mood, Roin would go directly over to the computers. "You see, by itself, without your thoughts, your ideas, or if you prefer, without your human soul, the computer is just a pretty box full of radio parts. How do you insert into this collection of microelectronic high-tech equipment a human thought? How do you get it to obediently render service? Exactly this is the goal which is pursued in the course 'Fundamentals of Informatics and Computer Technology.' Indeed, many of you are already taking it in school."

And under the supervision of the qualified specialists the boys and girls, genuinely intrigued, would become acquainted in a hands-on way with the "Agat" personal computer. It is such a fantastic and beckoning world of electronics technology that Senior Engineer Svetlana Sanakoyeva, Engineer Ketevan Gabelaya and Senior Technician Vano Balardzhishvili have been opening up to the kids!

It is not surprising that in the computer classrooms it was crowded every day. Many tried to go there for a second go-round. And word of the wondrous train car, which instantly got around, drew in ever more and more groups of children.

"To put it honestly, we did not even suspect what a success our class would be," says Svetlana Sanakoyeva. "The children were interested in everything--how computers work, what's inside them, what they can do... In one word, we didn't have a letup the whole time. Many of them would bring along their friends, their parents, their relatives... Even people who were pretty far removed from school would come just to take a look at the computers."

"If I had in my classroom even one such system, I could save so much time and energy, both mine and my pupils'. And they could master a complicated program more easily, with deeper understanding."

This wish was expressed by Mathematics Instructor of the Gurdzhaani Middle School No 3 Natela Alekseyevna Kachiashvili, who came to visit us one evening with five-year-old Vasiko. The class had made an indelible impression on her little son; most of all, of course, the mesmerizing computer games.

"Right now they are teaching the course 'Fundamentals of Informatics and Computer Technology' in the schools, they are doing practical assignments," Roin Mirianashvili tells us. "That's the way it should be. But still, unfortunately, in many regions of the Republic people have only a vague conception of what computers themselves are all about. For example, in Gurdzhaani there is one computer for four schools. How can you teach the children in such circumstances? Of course, propaganda train trips like this one help to some extent to familiarize the children, even partially, with computer technology. But as you yourself can understand, it is not a solution. We need to take decisive, significant steps."

It is hard not to agree with the opinion of the specialist. The situation must be corrected. But for now, a new column has been firmly established on the work schedule of the propaganda train "Young Communist of Georgia"--familiarization of the school children of the Republic with computer systems.

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HIGH SCHOOL COMPUTER TRAINING

Moscow EKONOMICHESKAYA GAZETA in Russian No 19, May 87 p 14

[Article, unsigned, entitled "Personnel: Initiative and Competence"]

[Text] The administration and the social organizations of the Kursk "Schetmash" Production Association and its subordinate school No 15 work closely together. The joint project receives its most active participation in the equipment of the classes and lab rooms. Since last year in the school the lab "Foundations of Informatics and Computer Technology" has been going on. Here the 9th and 10th grade students take part. At every lesson, the instructor Viktor Grigoryevich Okunev leads the children into the interesting and alluring world of computers, and teaches them to freely communicate with the "smart" machines. For the benefit of the joint project, the class is equipped and almost totally set up with current equipment. Here are operating 15 "Iskra-1256" accounting machine systems, 17 micro-calculators, an "Elektronika" video projection unit, and other hardware.

In the photographs: below--lessons proceed in the lab "Foundations of Informatics and Computer Technology"; to the left--"What is that on the screen?"

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FIRST ALL-UNION CONFERENCE ON PHYSICAL AND PHYSICAL-CHEMICAL PROPERTIES OF MICROELECTRONICS ANNOUNCED

Moscow MIKROELEKTRONIKA in Russian Vol 16, No 1, Jan-Feb 87 p 92

[Unsigned announcement]

[Abstract] The section of physical and physical-chemical principles of microelectronics, Scientific Council on the Complex Problems "Physics and Chemistry of Semiconductors," USSR Academy of Sciences, Institute of General Physics, USSR Academy of Sciences and Institute of Semiconductor Physics, Lithuanian Academy of Sciences will hold the first All-Union Conference on Physical and Physical-Chemical Principles of Microelectronics in Vilnyus 23-25 September 1987. The conference will be dedicated to fundamental physical and physical-chemical studies of promising processes and microelectronic devices, with primary attention given to microelectronic materials, super-clean substances for the production of VLSI circuits, methods of investigation and diagnosis of materials and structures, physical and physical-chemical principles of microelectronic processes, physics of microelectronics devices, three dimensional integrated circuits, problems of the creation of multilayer interconnections in VLSI circuits, and modeling of microelectronic processes and devices.

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FIRST WORKING CONFERENCE ON COMPUTER OPTICS

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 13, No 12, 1986 pp 2552-2560

[Article by A. S. Semenov]

[Text] The first conference on "Computer Optics" organized by the Council on Automating Scientific Research (Physics Section), as well as the Joint Council on "Optics" (the section "Planar Optics") and the Institute of General Physics of the Academy of Sciences of the USSR in conjunction with the Division of General Physics and Astronomy of the Academy of Sciences of the USSR was held between the 26 and 28th of May 1986 in the city of Svenigorod near Moscow. Approximately 100 scientists and specialists participated in the conference. The following issues were discussed at this conference: computer-designed planar optical elements; numerical methods of computer optics; computer-aided design systems for planar optical elements; nonlinear mechanisms of wavefront formation; technology for fabricating elements in computer optics; the computer-aided investigation of these elements; hardware and software used in studies on planar optics.

The achievements and problems of computer optics were the focus of the plenary paper given by I. N. Sisakyan (The Institute of General Physics of the Academy of Sciences). This paper was the first paper in the conference and it covered the concept of computer optics and discussed the prerequisites for its development and stages of future development. Computer optics are optical elements designed by computer and performing the necessary conversion of wave fields and, moreover, they are optics for computers, i.e., optical processors and memories. The elements of computer optics are designed and developed by high-speed computers with significant memory capability, control devices for image recording and processing manufacturing sets; microelectronic methods that make it possible to obtain surface structures with a spatial resolution down to 0.1 μm and numerical program control manufacturing sets used to treat the surfaces of elements measured in the meters accurate to approximately 1 μm.

Fig. 1. A multigradation amplitude mask of an infrared focuser (λ = 10.6 μm) and its focal lens (right). The density of the color in the amplitude masks is proportional to the height of the relief. Parameters of the focuser: diameter 40 mm; focal distance 400 mm; maximum relief height, 5.3 μm; width of the minimum zone: 200 μm.

The following areas may be identified in computer optics: the design, development and investigation of the properties of computer optics elements. The calculation and design of elements includes selection of a mathematical model, establishing the existence, uniqueness and stability of the solution, an investigation of the properties of the solution and selection of an optimum design, development of efficient calculation algorithms and a computer analysis with coding of data blocks for transmission to the device used to manufacture the element designed. Computer optics elements are developed for the X-ray, infrared, visible, ultraviolet, submillimeter and millimeter wavelength ranges as well as for acoustical waves. A number of computer optics elements have already been developed, including phase-only synthetic holograms, focusers (Fig. 1), various zone plates, elements for converting wavefronts, modal analyzers and synthesizers, Bessel optics elements, programmable lattices, etc. Both theoretical (analytical and numerical) and experimental studies are devoted to the properties of computer optics elements (aberrations, chromatism, energy efficiency, etc.). Numerical experimentation and computer applications for physical experiment control play a primary role in these processes.

The plenary paper by V. A. Soyfer (the Kuybyshev Aviation Institute) entitled "Automation of Experimental Research and the Computer-Aided Design of Planar Optical Elements" has generalized the experience gained in this field at the Kuybyshev Aviation Institute. Promising input-output software and hardware and optical image techniques are discussed. An experimental method is proposed and results are given from several calculation experiments with computer optics elements. The data base requirements for computer-aided design systems for such elements are formulated.

A. V. Goncharskiy (Moscow State University) discussed existing methods of obtaining a given intensity distribution of emission as well as emission focusing in the plenary paper entitled "Mathematical Issues in the Design of Planar Optical Elements." A number of mathematical problems occur in this area, specifically: selection of the mathematical model (it must be sufficiently simple though must provide the necessary accuracy for actual processes occurring in the optical system), the problem of the solvability of the design process, the uniqueness of the solution (in the majority of cases the problem has a nonunique solution), and the problem of developing effective algorithms for

solving inverse problems. A mathematical substantiation of the concept of integral intensity is given for the problem of focusing emission in an arbitrary line with a given intensity distribution.

The plenary paper by A. B. Shvartsburg (The Institute of Terrestrial Magnetism, the Ionosphere and Radio Wave Propagation) entitled "The Nonlinear Formation of Optical Wave Structures" demonstrated the possibilities for the manipulation of high power localized beams and wave field pulses in the visible, infrared and microwave ranges. Specific examples of the formation of narrow directional beams of complex cross-section (an ellipse with a given epicenter, ellipse rotation, beam splitting) in a nonlinear medium are given. The role of non-linear pulsed processes in waveguide systems were discussed. The promise of such processes for nonlinear information channels is emphasized.

The plenary paper by A. M. Shcherbachenko and V. P. Koronkevich reported efforts to develop diffraction optical elements at the Novosibirsk Institute of Automation and Electrical Measurement of the Siberian Division of the Academy of Sciences of the USSR. A computer-controlled precision laser photoplotter was manufactured that makes it possible to generate axiosymmetrical diffraction structures up to 300 mm in diameter with a spatial resolution of approximate 500-1000 lines/mm. The radial positioning accuracy is 0.1 μm with a disk rotation speed (with the photographic medium) of 0.1-25 s^{-1} and a 1 μm light recording beam. Such a photoplotter makes it possible to generate unique elements with axial symmetry.

The plenary paper by A. V. Tikhonravov (Moscow State University) discussed calculation methods of designing multilayered optical coatings. The conditions for implementing given spectral transmission coefficients and the uniqueness conditions for determining the parameters of the medium based on spectral data are derived. The mathematical results were used as the basis for investigating the necessary optimality conditions in optical, radiophysical and acoustical design issues and the optimality of two-component optical coatings is demonstrated. An approach is developed to obtain approximate relations that describe the primary spectral properties of layered coatings with highly reflective systems of layers: quarter-wave mirrors and filter-type multilayered interferential systems; simple analytical relations are found that describe the properties of these elements.

A. V. Gnatovskiy (The Institute of Physics of the Academy of Sciences of the Ukranian SSR) summarized theoretical and experimental research devoted to reducing emission divergence and generating the necessary directional patterns of laser beams including the case of fiber-optic systems. This approach is based on the spatial premodulation of a converted beam and the correction of its wavefront. The modulator largely produces a macrostructure of the modulated field: its symmetry, wavefront shape, etc. This makes it possible to use the same correcting element with variation in the spatial structure, wavelength and degree of coherence of the input laser emission.

The theory of coherent focusers in a geometric-optical approximation was the topic of the paper by B. Ye. Kinber et al. The difference between this theory and existing calculation methods is as follows. First, the problem of determining the surface of the focuser, i.e., a function of two variables is reduced

to a simpler task: determining the function of one variable whose physical meaning is reflected in the law of variation in the eikonal along the focal line. The solution of this problem is reduced to integrating a regular differential equation. Second, the solution to the problem of the focuser depends largely on how the intensity distribution along the focal line is to be understood. A comparison of solutions using the previous "integral" definition of intensity and determining intensity with a "local" nature (the square of the modulus of the field along the same focal line) has demonstrated that these solutions differ significantly.

The method of calculating the focusers accounting for diffraction is discussed in a paper by M. A. Vorontsov, A. N. Matveyev and V. P. Sivokon (Moscow State University). Such an approach to solving the focusing problem is clearly more significant when the focusing line does not lie in a single plane and when the dimensions of the focusing region become comparable to the dimensions of the diffraction-bounded spot. The method proposed by the authors is based on an iteration routine for searching for a phase profile of the focuser that provides as close an intensity distribution as desired at the focal line. The promise of using flexible controlled mirrors as the focusers was noted; the sufficiently smooth surface profile of the mirror made it possible to obtain a high quality intensity distribution profile.

The paper by V. A. Danilov (The Institute of General Physics of the Academy of Sciences) examines the beam structure of a field at the output of the focuser collected at the focal line. It is necessary to describe such beam structures to calculate the focusers. The features of a focal line are not considered in singularity theory, since they are unstable. A number of sample singularities are given and the problem of their description and classification is discussed.

Another paper by V. A. Danilov discussed the problem of the operational stability of the focuser with changes in the intensity distribution of the illuminating beam which serves to change the intensity distribution along the focal line. Distortions to a given intensity distribution in the focal line with shifts in the center of the illuminating beam with respect to the center of the focuser and changes in the width of the incident beam are examined. It is possible to improve the resistance of the focuser to such perturbations by dividing the unit into several parts, each of which independently focuses emission in the entire focal line. Superimposing several images provides mutual compensation of distortion to the intensity distribution along the line. by selecting the shape of the focuser parts it is possible to compensate for characteristic errors of the optical system.

N. L. Kazanskiy (Kuybyshev Aviation Institute) has examined the correction of the phase function of the focuser with a more significant depth of focus to compensate for diffraction effects that arise due to the digitization of the radial phase function in the fabrication of the element. The calculation experiment made it possible to visualize and quantitatively analyze the intensity distributions of the focused emission obtained in this case as well as to produce an iteration correction routine for correcting and optimizing the phase function of the focuser. Results from the calculation experiment made it possible to begin designing focusers with a more significant depth of focus and to carry out full scale tests.

Calculation of an aberration corrector for a thin lens was proposed by M. A. Golub (Kuybyshev Aviation Institute), et al. The formula given in this article relate the digitization and quantization parameters of the phase of the corrector, the parameters of the optical system (the field of view, the relative aperture, the focal distance, and the refractive index) to the quantities characterizing the quality of the optical system (the angular resolution, the Strehl number: the ratio of light intensities at the center of the blur circle for a real and zero-aberration optical system, etc.). The derived calculation data make it possible to make recommendations on selecting the resolution of devices used to manufacture masks and to determine the number of binary masks used in the fabrication of the planar aberration corrector.

A. E. Berezniy (The Institute of General Physics of the Academy of Sciences) et al. discusses research on the directional patterns of raster phase elements. Controlling the directional pattern of optical elements is an important area for many applied problems in modern optics (holography, optical data processing, optical tomography, etc.). By using an optical element with a given directional pattern in conjunction with other computer and traditional phase elements, it is possible to implement such optical devices as beam splitters, multifocal lenses and image multipliers, multichannel filtering systems, focusers, etc. The authors calculated the characteristics of elements with an equalized directional pattern at a given angle, elements with both an asymmetric and complex directional pattern and two dimensional elements. The influence of manufacturing error on the directional pattern of the elements was investigated. Elements with square, grid and quasilinear directional patterns were fabricated and tested experimentally together with elements operating in the microwave range (λ = 3.5 mm). The experiments have demonstrated a close correlation between the results obtained and those calculated and again confirm that today manufacturing difficulties are the primary issues for phase elements, although they are clearly reduced as the wavelength of emission is increased.

The paper by A. E. Berezniy et al. was devoted to an experimental investigation of the conversion of Cartesian coordinates to polar-logarithmic coordinates. Such a conversion is important for holographic pattern recognition that is invariant to rotations, changes in scale and shifts in the input signal. Holograms were fabricated for a phase function that represents a given spatial conversion of coordinates with different parameters and coding methods. The experiments demonstrated the possibility of using existing technology to develop optical systems for performing a variety of analytical transforms.

A. E. Berezniy and I. N. Sisakyan have proposed using a phase filter that performs a Bessel function analysis of planar optical fields with circular symmetry. The field of application of the Bessel optical transform includes primarily optical beams with axial symmetry. In order to carry out such a transformation of the optical field, it is sufficient to use, in the entrance plane, a lens performing a Fourier transform, and an angular phase filter, both in the form of a binary hologram.

The problems of developing an optical antenna employing computer optical elements at the aperture to generate the desired field distribution were considered in the paper by V. A. Soyfer et al. The concept of the directional pattern in

the Fresnel diffraction field for emission with an arbitrary degree of coherence is introduced. An algorithm is developed for calculating a computer-designed optical element that provides maximum similarity between the directional pattern and the desired directional pattern for a given spectral density of the emission field. The calculation methods and computer algorithms are used to design an amplitude mask of a planar optical element generating several emission lobes along one angular coordinate.

Results from a calculation of a three-dimensional symmetric bifocal optical system, i.e., a system in which the aberrations are eliminated for two directions of the planar waves was proposed by V. K. Bodulinskiy. The bifocal systems have lower aberrations in the given angular sector than existing devices with an identical number of reflecting or refracting surfaces. The angle of aspect of the bifocal systems is 3-5 times greater than in Cassegrain and Schwarzschild reflector systems. The algorithm developed by the authors for calculating the two reflector surfaces allows an analysis of the dependence of the solution on the initial parameters of the system and makes it possible to impart the desired properties to the system by varying such parameters. Conditions are given in which a large reflector may function as the surface of rotation.

The design of optical systems with aspherical reflector surfaces was the topic of the paper by B. E. Kinber. The application of such surfaces expands on the capabilities of optical systems which may be used to achieve a variety of goals. Problems in mathematical physics and methods of solving these problems that arise in this field were examined. The formation of a random wavefront with given polarization and amplitude distributions by an optical system was discussed. Such systems have already been in operation for more than 20 years in the centimeter and decimeter wavelength ranges. Optical systems with few mirrors having low order aberrations over a broad angular sector were also considered. The development of computer technology has made it possible to use these systems in the submillimeter, infrared, and visible ranges.

V. A. Danilov and other speakers presented a paper on studies of planar focusing elements in the millimeter wavelength range. Zone plates and lenses consisting of two elements have been developed for this range. The authors reported the development and fabrication of lenses 40 mm in diameter with a focal distance of 500 mm (λ = 4 mm) designed for point focusing of a planar wave; of an element for point focusing of a spherical wave (diameter of 50 mm, with a forward and rear focal distance of 500 and 1500 mm, respectively; Fig. 2); and of a cylindrical lens with a focal distance of 800 mm. The flat surfaces of the lens and a cylindrical lens were combined to focus the spherical wave in the segment. The results from focusing such elements were recorded by means of a thermo-microwave imager.

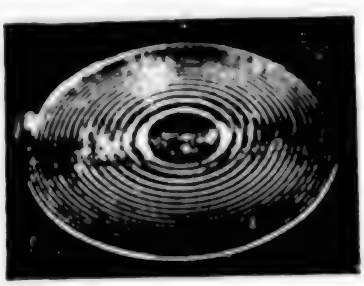

Fig. 2. Element in the millimeter wavelength range (λ = 4 mm) for point focusing of a spherical wavefront.

Fabricated from plexiglass on a numerical program control manufacturing set; lens parameters: distance to

emission source: 50 cm; focal distance: 150 cm; diameter: 50 cm; height of relief: 6-7 mm.

G. I. Greysukh, I. M. Efimenko, and S. A. Stepanov (The Penzensk Engineering Construction Institute) analyze methods of constructing projection and focusing optical systems using diffraction elements. It was noted that one common drawback of integrated systems based on homogeneous refraction and diffraction lenses is the difficulty of simultaneous correction of astigmatism and field curvature of several aberration orders. Systems in which the refraction lenses are fabricated from a material with a given refractive index profile are largely free of this drawback. A system consisting of a gradient lens with spherical surfaces and diffraction asypherics may be used as a high-aperture focusing lens or as a projection lens for formulating a stigmatic image on a plane.

The possibility of using diffraction lenses for high-efficiency focusing of emission from injection semiconductor lasers in optical disk reading systems was discussed in the paper by G. I. Greysukh and S. A. Stepanov. Diffraction lenses make it possible to significantly enhance the size and weight characteristics of the device and to eliminate spherical aberration by selection of the proper interlacing of the lens microstructure and to virtually eliminate spherical-chromatic aberrations (caused by the variation in the wavelength from various types of lasers) and by selection of the distance between the laser and lens as well as to minimize spherical aberration caused by the change in the laser wavelength resulting from changes in external temperature by proper selection of the focal distance. The diffraction lens is a plane-parallel plate with an applied photosensitive layer containing the microstructure of the lens. The microstructure may also be fabricated as a relief directly onto the wafer.

The paper by A. S. Markin and V. B. Studenov (The Moscow Institute of Radio Engineering, Electronics and Automation) considers a method of spatial filtering of any order optical harmonics; this method utilizes the dispersion properties of the zone plate. A method is proposed for calculating the filtering efficiency as a function of the parameters of the filter and the set of harmonics. Experimental results are given on the filtering of the second and third harmonics of the neodymium laser.

M. A. Gan and I. I. Bogatyrev presented results from theoretical and experimental research on the development, based on phase-only synthetic hologram optical elements, of high-resolution apochromatic systems operating over a broad spectral range. The authors carried out a comparative analysis of the aberration and dispersion properties of computer optical elements and regular optical elements.

N. I. Petrov (The Institute of General Physics of the Academy of Sciences) et al. discussed the possibility of determining the dimensions of aerosol particles using synthesized elements performing a Fourier-Bessel analysis. Since the scattering intensity with low angles is proportional to the square of the Bessel function, the use of spatial filters with a transmission factor proportional to the superposition of the orthogonal Bessel functions makes it possible to determine the relative intensities of emission scattered by particles of various size and thereby to determine their dimensions.

V. V. Popov (The Institute of General Physics of the Academy of Sciences) surveyed the materials and methods used to develop planar focusing elements. The focusers were phase zone plates fabricated either as flat plates with a high surface relief in the order of the emission wavelength or in the form of thin films with a purely phase relief achieved by varying the refractive index. The first type of elements (with the surface relief) are more widely used due to their ease of manufacture, as well as the possibility for their use as reflecting focusing elements and the fact that they may be easily circulated using standard manufacturing techniques such as electro forming impressing, etc. Elements for the mid and far infrared and microwave ranges were fabricated on precision numerical program controlled manufacturing sets. In order to fabricate elements for the visible and near infrared ranges, light-sensitive materials, (such as bichromatic gelatin) used in holography are most often employed. The use of photolithography methods are promising; these provide advantageous resolution of the elements. (With a reduction in energy efficiency). Chalcogenide vitreous semiconductors may be used to develop elements of both types operating in the visible range. Elements with a purely phase relief may be fabricated by bleaching photomaterials used in holography. However the high level of noise and the difficulty in providing phase correspondence at the edges of the zones of the elements make it impossible to use this method to fabricate high quality elements for the visible range. Photographic polymers and selective etching of semiconductors are among the promising materials and methods.

Two papers were devoted to the applications of focusers for laser treatment of materials. S. F. Ageshin (The Institute of General Physics of the Academy of Sciences) et al. have demonstrated the advantage of using focusers for laser thermal hardening and alloying of metals, since the need for a scanning system for scanning the beam along the worked surface is eliminated. Copper reflection focusers fabricated by electro-forming make it possible to focus and rotate by 90^0 emission from a 5 kw CO_2 laser. When sharp emission focusing is required (for example, for laser cutting of metals) the use of a focuser which acts as an off axis parabolic mirror, makes it possible to rotate the beam and focus it on a particular point with a smaller diameter than provided by traditional optical elements. The use of a focuser consisting of several parts each of which focuses emission on a specific point on a surface makes it possible to provide high-efficiency, simple and rapid laser labeling of products by letters (Fig. 3). The possibilities for using focusers in laser opthamology are interesting: the focusers make it possible to make simultaneous cuts of equal size in the cornea.

In the second paper V. P. Shorin (Kuybyshev Aviation Institute), et al. have demonstrated that the use of focusers for laser annealing of metals for manufacturing parts by bending make it possible to significantly reduce the forming force and to use a universal dye while significantly reducing the metal consumption of the dye and reducing the tolerances on the cutting of the blank. The use of focusers and a continuous CO_2 laser operating at 0.7 kw with z shaped profile bending of aluminum alloys increased the press productivity by a factor of 2. The use of the focuser also makes it possible to use high temperature and high speed laser alloying by using reinforcing additives in metal and to treat the surface of a part to a uniform depth without cracking. The focuser has also proven to be an efficient tool in the laser welding of sheet polymer materials.

by overlapping. The strength and integrity of welds have improved due to the uniform (maximized at the center) distribution of emission power along the laser cut. A number of papers given at the conference (authors: A. B. Balyaev, G. L. Esayan, S. G. Krivoshlykov, I. N. Sisakyan, S. N. Yanchenko all from the Institute of General Physics of the Academy of Sciences) were devoted to the propagation and conversion of emission wavefronts in gradient fiber-optic and waveguide media. It was demonstrated that it is possible to shape a given wavefront by introducing certain regular longitudinal (on the axis of beam propagation) inhomogeneities in the medium. If we know the beam parameters in such waveguides, we may also solve the inverse problem: determining the parameters of the inhomogeneity of the medium. Using the longitudinal inhomogeneities with a varying period, we may effectively alter the wavefront of the emission propagating through the waveguide. V. V. Dodonov (The Moscow Engineering Physics Institute) and O. V. Man'ko (The Institute of Nuclear Research of the Academy of Sciences of the USSR) have demonstrated that for paraxial beams propagating in a parabolic waveguide with a refractive index that varies on the axis, universal invariants exist that are preserved on the beam axis independent of the specific coordinate dependence of the refractive index. M. A. Man'ko, B. I. Makhsudov and Fam Ban Khoy (The Physics Institute of the Academy of Sciences) have investigated the astigmatism, wavefronts and directional pattern of emission of stripe planar GaAlAs heterolasers for various pumping levels.

The non-linear modulation of microwave beams and pulses interacting with collisional plasma from n-type (Ge and InSb) semiconductors was examined by I. D. Bagbaya (Abkhazskiy State University). In the paper entitled "The Nonlinear Evolution of Pulses of Various Shape in a Fiber-Optic Lightguide", A. Yu. Sherman (The Kuybyshev Electronic Institute of Communications), et al. using a numerical solution of the nonlinear Schrodinger equation describing the propagation of a localized high intensity field in a lightguide with a cubic polarization characteristic investigated the evolution of the complex envelope of a family of single and paired pulses in the form of trunkated elliptical cosines including pulses corresponding to solitons.

V. P. Garichev (The Institute of General Physics of the Academy of Sciences) et al. presented results from experiments on the selective excitation of low order axially symmetric modes in a multimode gradient waveguide by means of synthesized holograms. Photographs of the field distribution at the exit of the waveguide have demonstrated a high degree of excitation selectivity. The experimentally derived dependencies of the mode excitation coefficients on the radial displacement of the excitation beams are in satisfactory accord with calculated data.

We will briefly cover the primary areas and results from research on the automation of experimental research and the computer-aided design of computer optical elements discussed at the conference. The primary stage in the development of computer optics has been the development and use of comprehensive computer aided design systems for such elements. One such system developed at the Kuybyshev viation Institute was discussed in the paper by E. Yu. Aref'ev et al. This system has been used successfully in experiments on reconstructive tomography (E. Yu. Aref'ev and I. D. Bagbay, et al.). The broad utilization of computer optics elements is impossible without the use of flexible automated manufacturing of elements; hence, the experience of manufacturing elements

operating in the millimeter and submillimeter wavelength ranges on numerical programming control manufacturing sets is clearly important (Ye. D. Bulatov, S. A. Gridin and A. A. Danilenko (The Institute of General Physics of the Academy of Sciences)). A number of papers demonstrated the hardware and software capabilities of personal measurement-calculation systems for experimental studies of elements. A few papers were devoted to the development of distributed computer complexes based on both similar and different computers. Selection of an optimum operating system is important for automation systems. The paper by L. I. Brusilovskiy (The Institute of General Physics of the Academy of Sciences) et all provided a survey of the primary operating systems. The use of the MODULA-2 programming language for automating physics experiments was discussed. This language has a number of advantages: it is easily convertible to a variety of computers, does not require extensive calculation capacity and is convenient for processing graphics and optical information.

The conference demonstrated that a new field has appeared in optics: computer optics. The computer has been used to develop a number of elements for operation over an extraordinarily broad wavelength range (from the X-ray range to the millimeter range) and for converting acoustical signals. And although the first element of planar optics - the diffraction grating - was developed exactly two centuries ago, the real success in this field has come in the last 10-15 years with the development of the phase-only synthetic hologram and the focuser. It is still difficult to accurately evaluate all the potential possibilities of computer optics, although even today the use of such elements is being felt in laser technology, medicine, and optical data processing and transmission. Computers are widely used in digital holography, optical image processing, adaptive optics, in the design of lenses, optical filters, multilayered coatings and antenna design. Hence the development of a new field at the edge of different scientific disciplines may result in an increase in their interrelationship and to a conceptual enrichment of both fields.

The papers of the First Conference on Computer Optics will be published in 1987 at the International Center of Scientific and Technical Information (Moscow) in two parts: "Physical Principles" and "Computer-Aided Design and Technologies.":

In conclusion the author wishes to express his sincere gratitude to B. A. Danilov and L. I. Brusilovskiy for their help in the preparation of this survey.

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CONFERENCE DISCUSSES SOFTWARE FOR PORTABILITY

Moscow RABOCHAYA GAZETA in Russian 12 Sep 86 p 1

[Unsigned article datelined Kiev, 11 Sep 86, by a RATAU correspondnet, "An Orchestral Score for Computers"]

[Text] The Institute of Cybernetics imeni V. M. Glushkov of the Ukrainian SSR Academy of Sciences is one among many scientific teams in our country which have been taking part in the creation of new operating systems and programming technology which make it possible to implement one and the same program on any computer. With their appearance a serious step has been taken towards program unification. This was disclosed at the conclusion, in the capital of the Ukraine, of a Republic-level seminar on problems of management of data processing technology at multiuser computer centers and on computer networks. Programmers from many cities in the Ukraine, as well as researchers from Moscow, Leningrad, Tallin, Kalinin, and other centers of science in our country, took part in the seminar.

"Unified software for various types of computers is the dream of every specialist in this field," said the scientific leader of the seminar, Candidate of Technical Sciences B. N. Panshin. "Today, you see, a software package for a routine task costs more than the very computer that it runs on. In the course of many years we have created new programming languages, new methodologies, new operating systems, but they all inevitably bear the marks of the particular type of computer on which they were developed."

Widespread computerization of the national economy has given birth to an information technology represented by large computer centers and by personal computers, by comprehensive automation and by specialized information systems. Correspondingly, more and more different types and classes of computers are making their appearance. Such is the law of specialization in electronic computer technology for different purposes in science, in industry, in medicine, in daily life. The engineers and electronics types are doing a lot towards being able to "hook together" computers and various types of peripheral equipment--not only hardware "of the same family", but also hardware developed for other models of computers. Right now what is necessary is a single governing program similar to a score for a large orchestra. It has to be able to understand both the "solo" of a personal computer on which one specialist is working and the "chorus" of the many programs in use on a multiuser computer system.

Improving the management of the various branches of the information industry, heightening the effectiveness of exploitation of costly computer resources--such is in part the range of questions examined by the participants in the seminar, which was organized by the Republic House of Economic and Scientific-Technical Propaganda of the "Znaniye" ("Knowledge") Society of the Ukrainian SSR and by the Institute of Cybernetics imeni V. M. Glushkov of the Ukrainian SSR Academy of Sciences.

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INSTITUTE OF COMPUTER MATHEMATICS, GSSR ACADEMY OF SCIENCES

Tbilisi MOLODEZH GRUZII in Russian 25 Sept 86 p 2

[Unsigned article, entitled "Masters of the Queen of Sciences", accompanying three photographs by R. Saakov]

[Text] It is hard to imagine today a branch of science which could get along without the "services" of mathematics. On the crest of the acceleration of scientific and technical progress in our country, the exploitation of electronic computer technology takes on ever greater significance. And once more mathematics and mathematicians are coming to the aid of specialists in the most varied of fields.

The present-day tasks of developing problem-solving methods in computer mathematics, creating software for modern computers, and practical exploitation in various branches of the national economy of the achievements of the science of informatics--this is only an incomplete survey of the activities of the Institute of Computer Mathematics imeni N. I. Muskhelishvili of the Georgian SSR Academy of Sciences.

In the photographs: Senior Engineer Lozana Kakabadze and Leading Engineer Nodar Yakobashvili in the YeS-1040 computer room at work processing data obtained with the help of the computer; Member of the Young Communist League Valeriy Leshchenko works as a technician in the YeS-1045 computer room. He has schooling under his belt from Professional and Technical School No. 133, from which he graduated with honors three years ago; YeS-1040 Computer Room Operator Liya Papinashvili mounts a disk.

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